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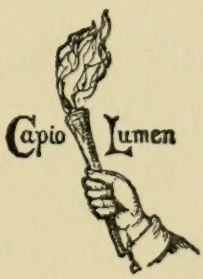
By

A. H. UNWIN, D.Œc., M.E.F.A., M.C.S.F.E.

PRINCIPAL FOREST OFFICER

CYPRUS



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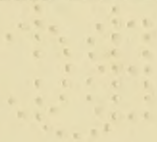

TO

HIS EXCELLENCY THE GOVERNOR OF CYPRUS,

SIR RONALD STORRS, KT., C.M.G., C.B.E.,

THIS BOOK IS BY GRACIOUS PERMISSION

DEDICATED BY THE AUTHOR IN TOKEN

OF HIS INVALUABLE AND CONSTANT

SUPPORT OF FOREST POLICY AND

PRACTICE IN CYPRUS

PREFACE

I AM greatly indebted to Mr. B. J. Reilly, Assistant Conservator of Forests, who collaborated and gave valuable assistance in reading and altering the text, and arranging the quotations from some of the authorities.

My thanks are due to Mounted Forest Guard I. Sidki for helping to mark and copy out all references in periodicals and Forest literature.

To the Chief Clerk, Mr. E. P. Prince, my thanks are due for his reading of the typewritten copies, as also to Mr. E. N. Boutros for having typed four copies of the whole book.

Only those who have tried this kind of writing can appreciate to the full the amount of work put in by the officers of the Forest Department already mentioned, and without their aid it would not have been possible for me to compile this book.

A. H. UNWIN,
Principal Forest Officer.

CONTENTS

INTRODUCTION

As there appears to be a great deal of misconception and ignorance in the public mind relative to the evils arising from the continual grazing of goats in the Forests of the Island, it is necessary to give a concise and complete picture of the history, as well as the present state of the question.

The common fallacy is formed somewhat as follows: Most people acknowledge that planting and Forests do play a great rôle in the water conservation and timber and fuel supply of the Island, yet at the same time they say goats do not damage the Forests and goat-grazing should be allowed. On the other hand, on their own properties they would not dream of allowing goats to graze untethered, on account of the damage caused. Again, they think it is possible to have a grazing- and fuel-ground near the village, yet before their own eyes is to be seen the result—in most cases a bare patch of rocky ground. It is significant that despite the efforts of four trained Foresters and several years of endeavour on the part of the late Mr. Bovill, many goatherds and others still do not believe what they have been told on the best professional authority in the civilized world.

It is with a view to combating this gross inconsistency on the part of many people that this book is being presented to the people of Cyprus by a thoroughly technically trained Forester, who has had experience of Forestry conditions in twenty countries. It should be specially noted that consideration and conciliation of all legitimate wants of the local population living

near the Forest is the first duty of the professional Forester. Within the possibilities of his charge, he is the very man whose business it is so to improve and ameliorate the conditions in the Forest that the local people gain in every way. A full perusal of the records would, I think, convince any fair-minded person that every effort has always been made to meet demands by the local people on Forest produce, including grazing. However, these attempts have been met with continual theft of Forest produce, illicit grazing on a wholesale scale, and only by the most determined efforts on the part of the Forest Staff has any Forest remained at all.

The disappearance of many of the fine Forests which existed in the world, and more particularly in the Mediterranean region, may be attributed to fitful cultivation, to excessive felling, and, most important of all, to the uncontrolled grazing of animals. These evils are still exerting such an influence on what remains of that Forest growth that, unless arrested, its ultimate ruin is certain. This destruction has not been a sudden operation: for centuries the Forests have been steadily depleted of their wealth. The position at the present time is serious, as the prospect of a future timber shortage must be faced. Fortunately, the dependence of man upon the existence of Forests is now being universally recognized, and precautions are being taken by the formation of Forest Services, by educating officers in the sciences directly or indirectly connected with Forestry, by protecting the remaining Forests, and by laying the foundation for the regeneration of those which have disappeared.

The question of Forest conservancy has been debated so much recently that it has become of general interest. There appear to be two contending factions, the first of

which, consisting of the more educated and progressive men, recognizes and upholds the necessity of excluding goats from the Forests; and the second—a more primitive class, represented by the landless shepherd—depreciates the destruction caused by goats, and contends that it is more important to administer to the requirements of the shepherd, than to protect the Forests.

The object of this book, which deals primarily with grazing questions, is to place before the public the views expressed by Forest Authorities in different parts of the world, which emphasize the principle that grazing, unless properly controlled, damns all prospects of Forestry, and describe the methods adopted in other countries to overcome adverse conditions, analogous to those prevailing in Cyprus. Most of these are the views of men who, having made exhaustive studies of these matters, are best qualified to publish reliable books. They describe the problems so clearly and concisely as to render amplification unnecessary. It is hoped that by publishing a judicious selection of extracts from such works, the matter will be laid before the public in the most demonstrative way.

They are not confined to the damage caused by goats, but include data applying to sheep, other cattle, and the need for afforestation. Although many may appear to be almost identical, they were retained to show that the same fundamental factors regarding Forestry are recognized throughout the world.

It will be seen that the grazing question in each country is dealt with by the Forest Authorities giving due consideration to the requirements of the people and the climatic conditions governing the growth of Forests. In Cyprus, the axiom that it is the Forester's

first duty to improve and ameliorate the conditions of the local people has been strictly followed.

The book should throw light on many problems, and be instructive to those who, while admitting that Forests are indispensable for the conservation of water and for timber and fuel supplies, uphold grazing and maintain that goats cause only slight damage.

GOAT-GRAZING AND FORESTRY IN CYPRUS

CHAPTER I

THE ECONOMIC CONDITIONS OF GOAT-GRAZING IN 1880 AND TO-DAY

To many people it may appear strange, but also significant, that there never were any wild goats in Cyprus, despite the fact that Cyprus was once joined to Asia Minor; though the Moufflon, a species of wild sheep, are to be found. Nature usually gives each country what can live and thrive in that country; it is therefore most curious that wild goats are not found in Cyprus. From historical records it appears that the Persians were the first to bring goats to Cyprus. When the value of them is contrasted with their depredations over a period of two thousand years, it cannot be gainsaid that they have been the ruin of the country.

The first report compiled for the Intelligence Department of the Quartermaster-General in 1878 gives some account of the number of goats in previous years. The following extract is taken from *Cyprus*, by Captain A. R. Savile, London, 1878:—

> The flocks of sheep and goats form a considerable portion of the wealth of the Island [in 1862].

Consul Riddell's Report for 1872:—

> The pasturage is often scant and generally precarious during the summer and autumn, there being nothing beyond the rough

produce of the uncultivated hill and tablelands, so that whenever rainfall is insufficient the food is scanty, and many of the flocks of both sheep and goats perish from disease generated by insufficient nourishment. Goats are able to subsist better than sheep during periods of drought. The total number of both in the Island is computed at about 800,000 in the proportion of one-third sheep to two-thirds goats.

The numbers, exclusive of lambs and kids less than one year old, were about 400,000; but Consul Watkins reports that in 1877 the number of sheep alone was estimated to be 750,000. These flocks browse upon the herbs of the uncultivated districts.

Considering that the statement is so often made that the goats have always pastured in the Forests, it is strange that it was not mentioned in these official reports dating from a period previous to the British Occupation. The fact appears to be that there was enough waste land for them to graze on without troubling the Forests with their unwelcome presence.

From the survey of the Island made by Lord (then Captain) Kitchener in 1881, it is possible to find out the area of tree-covered land, outside what has since become the delimited Forests of the Island. The area outside these Forests amounted to 488,760 acres of more or less wooded land. Within this area there were most of the present villages, but with a smaller population. In 1881 the population of the Island amounted to 186,173; whereas at the end of 1926 it was estimated at 335,015. This increase in the population must be taken into account, especially in the villages. During the period between 1881 and the present day nearly the whole of this wooded area outside the Forests has been cleared for the making, to a slight extent, of vineyards and arable land, but in most cases has been left as bare

rock or ground covered with boulders. In the majority of cases it is safe to say that such land should not have been cleared for agricultural purposes, as it is not fit for crops but might be used for growing trees.

At the same time it is clear that the villagers had this area available for their flocks and herds, which were about the same number as to-day. From the map left by Lord Kitchener it is evident that the wooded area outside the Forest bore a good deal of herbage, as most of it is situated in the forehills of the more mountainous parts of the Island.

From an examination of the available records it appears that most of this land was hali or unoccupied, unowned land. Gradually areas were taken up and cleared, thus the process of devastation of the woods went on. At the same time goats and other animals were pastured on such areas and helped and quickened the process of soil erosion and general impoverishment of the land.

Nevertheless, as time has gone on, more goats have been admitted to the Forests, with the result that erosion has and is still taking place on a greater scale.

From a report of Mr. A. E. Wild on the Forests of the South and West of the Island in the year 1879, it is clear that all the Forests and wooded areas were subject to the following unrestricted uses:—

1. Clearings for temporary cultivation. After two or three crops had been taken off the land was abandoned.
2. Cutting of trees for the making of troughs, beams, and rafters almost without restriction.
3. The tapping and burning of trees for the extraction of resin.

4. The extraction of pitch from the lower part of the bole of living trees.
5. "The prevalence of fires caused by the carelessness of the shepherds."

Since the time of this report, fortunately all except the last-named evil have been more or less controlled, so that the Forest has had a chance to improve. However, the greater number of animals actually grazing in the Forests in a later period has to a great extent offset the good done by the protection of the Forests in other ways.

This is a most important factor to take into consideration in connection with the past and present position of grazing in the Forests. Owing to their inaccessibility, many of the present delimited Forests were not subject to so much grazing as to-day, especially as there was a belt of woody land surrounding them. On the other hand, the Forests in 1881 suffered from excessive utilization in every way, and the haphazard method or lack of system in the extraction of timber, resin, and pitch.

There is another important factor which is more difficult to prove. In the 'eighties the villages were much smaller than now, and the number of animals, though about the same as to-day, was spread amongst the larger villages of the plains and open country, as at that time there was a very large area of bare or uncultivated land available. Then, too, the towns have increased in size, so that land which was once used for agricultural purposes is now covered with buildings or has been turned into gardens.

In a similar way in several parts of the country, quite apart from the growth of the towns, ordinary agri-

cultural land has been turned into gardens, orange and apple orchards, or vineyards. In consequence of this process, less land is available for the pasturing of flocks and herds under the old primitive system of allowing them to roam over the fallow, as well as other land, which is unenclosed for the most part, or, as it was in 1880, entirely unfenced.

Another factor which has influenced the extensive system of nomad goat-herding is the increasing value of the milk, cheese, hides, and meat for food purposes. Whereas in 1880 the majority of goats were kept mainly for the feeding of the owners who kept them, now a most lucrative business has grown up in keeping goats grazing in the Forest with or without a goatherd, and then selling their produce in the summer season to the hotels in the hill villages of Platres, Pedula, and other places. In addition, there are the demands of the mine company's men and officials for meat, cheese, and other products. Thus, in addition to the great volume of alternative employment, which is now available to everyone in the villages, there is the extra advantage and benefit of keeping goats at the public expense in the State Forests without any charge, except for the few permits issued on payment.

The whole grazing position has radically altered during the last forty-eight years. Whereas there may have been some justification for the issue of grazing permits and consequent damage to the State Forests, there appears to be none to-day, as the goatherd has a good opportunity to earn a living under better conditions, and with equal if not more profit, by conducting his pastoral operations under a modern system of animal husbandry.

In other countries economic necessity would have

driven him to the adoption of a better and less wasteful system long ago. Here, owing to his constant plaints of poverty and ignorance, the public domain was opened to him, so that he could raise goats without expense to himself. It is strange, too, that during the period under review the rest of the tax-payers did not raise objection, or only occasionally protested at the squandering of the public resources for the benefit of about two thousand of the least energetic and thriftless goatherds who form only 2·37 per cent. of the population.

Turning once again to Mr. A. E. Wild's *Report on the Forests of Cyprus*, 1879, the list of villages and forests and the employment of their inhabitants in 1881 given on the next page throws a clear light on the conditions prevailing at the time.

On the one hand the numbers of people employed are small, yet on the other, their work in the Forests was most destructive. Side by side with this was the occupation of the goatherds, who are not mentioned except as already explained above in connection with fires.

It is strange that a trained Forest Officer belonging to the Indian Forest Service, such as Mr. Wild was, should not have stressed the fact that there were numerous goats in the Forests. After fifty years it is difficult to visualize the conditions, but from the smallness of the population near the Forests and the belt of woodland at the edge of the delimited Forests, it can be understood that there was not the same necessity as to-day to go right into the heart of the Forest for grazing, at any rate for the whole year. Conditions were easier in every respect. Land was not cultivated as it is to-day; although the main Forests were in a very bad condition, generally speaking, there were more trees

LIST OF VILLAGES, PART OF THE INHABITANTS OF WHICH GAIN THEIR LIVELIHOOD THROUGH OPERATIONS IN THE FORESTS

District.	Name of Village.	Name of Forest.	Number of Men Employed.	
	A. *Woodcutters*			
Papho	1. Panaya	Panaya	55	
	2. Aya Nicola ..	Panaya	10	
	3. Asproya	Panaya	12	
	4. Fidi	Panaya	8	
	5. Girit Marot ..	Panaya	9	
	6. Lassa	Panaya and others ..	6	
	7. Argaga	Panaya and others ..	12	
	8. Yallia	Panaya and others ..	28	
			—	140
Nicosia	1. Ispilia	Asine		
		Karuna	30	
		Ispilia		
	2. Kurdali ..	Lahudara		
	3. Kyperounta ..	Ispilia		
		Asine	4	
		Lahudara ..		
	4. Kandria	Asine	3	
	5. Kakopetra ..	Karuna	6	
	6. Galata	Karuna	12	
	7. Kalyana	Xeragogo	13	
	8. Temirga ..	Xeragogo	8	
	9. Korako	Xeragogo	7	
	10. Aya Biphan ..	Xeragogo	5	
	11. Kalapaniot ..	Xeragogo and Xero	4	
	12. Ambelico ..	Xeragogo and Xero	8	
	13. Erakess	Xeragogo		
		Roishia		
		Katzarri	8	
		Mavro Siges ..		
		Xomelon		
	14. Kambo	Roishia		
		Katzarri		
		Mavro Siges ..	15	
		Xomelon		
	15. Tsakistra ..	Xomelon	6	
	16. Gallini	Xomelon	8	
	17. Ludro	Xomelon	9	
	18. Xero-Vuni ..	Xomelon	8	
	19. Kaleri	Xomelon	8	
	20. Pyrgo	Xomelon	9	
	21. Amarges.. ..	Xomelon	9	
			—	180
	Total Woodcutters	.. .. ..		— 320
	B. *Resin Extractors.*			
Nicosia	1. Mylikouri ..	Roishia	40	
	2. Tsakistra ..	Katzari	6	
	3. Kambo	Mavro-Siges ..	9	
	4. Erakess	Xomelon	8	
			—	63
	Grand Total Deriving Maintenance from Forest Operations			383

scattered about the Island. There appears to be another important point. In the early days Tylliria was wild and lawless country, in which the Turkish officials were unable to collect the taxes, and where theft, especially of live stock, was rife. Nowadays, on the other hand, the Forest is almost safer for animals than the open country, because there are always some Forest guards patrolling or supervising some work or other in the Forests.

Compared to other parts of the Island, there are in the Paphos Forest only the ruins of one or two churches, as well as the present monastery of Kykko, which, it is known, was founded in A.D. 1100. It is this institution which has ruled the Forest and has had the greatest influence in shaping its destiny. The villages of Kambo, Tsakistra, Mylikouri, and Livadhi have also had their share, but nowadays cannot be recognized as the erstwhile hamlets of a few woodcutters and pitch-burners with the prosperous saw-millers, vine-dressers, orchardists, and rose-growers of to-day.

Whereas in most other countries within a period of fifty years a complete change and vast improvement in agricultural methods has been witnessed, in Cyprus this has not been the case, as little or no pressure has been brought to bear on the goatherd to cease troubling the Forest with his unwelcome presence and his all-devouring goats. He still lives free of charge on other people's property, and at the same time the country bemoans its poverty, while not seeing that it is directly due to the keeping of animals in unenclosed areas without any proper food supply or prepared pasture.

CHAPTER II

ANCIENT AND MODERN REFERENCES TO GOAT-GRAZING AND ITS DAMAGING EFFECT ON FORESTS IN GREECE AND CYPRUS

In a standard work on Forestry in Greece, entitled *The Administration of the Forests of Greece in* 1924, by P. H. Kontos, there is the following illuminating passage, as rendered into English, on the goats in olden times:—

As "nomadic" is described also the life of the Cyclopean race, by Homer (*Odysseus*, Book I, p. 106), and also by Plato (*Legal*, Book III), i.e. the Cyclopean who then inhabited, as it is believed by some, the territory of the present Albania. . . .

From a page of Homer we have the following:—

They do not plant any seedlings by hand, nor do they plough, but all these grow up unsowed and without ploughing, but they (the Cyclopeans) dwell inside hollow caves on the summits of high mountains, and their country is covered by Forest, within which these innumerable wild goats wander, because they are not followed by human footsteps nor tracked to their lairs by sportsmen, who suffer bitterly in the Forest in climbing the peaks of mountains.

From the *Introduction to the Study of Modern Forestry*, by J. C. Brown, is taken the following, which in turn was taken from *Le Bulletin de la Ligue, Reboisement de l'Algérie*:—

From Madrid to Jerusalem history and geography tell the same tale: Forests given up to sheep and goats; Forests destroyed; mountains devoid of woods; mountains devoid of life (Broillard, *Les Massifs de Spain et la Disette de Bois en France*). Anyone who has travelled in these regions must even to-day say they are largely true. The ravages of goat-grazing extending over several centuries

cannot be cured within fifty or a hundred years. That is the extremely sad part of the business, and it is hard for the untrained public in Forestry matters to appreciate this to the full. It is all the more difficult in a dry climate, such as that of the Mediterranean, especially towards its eastern end, where it is under the influence of the dry desiccating Asiatic winds.

That this problem was somewhat appreciated many years ago, ample tribute is borne by a recently issued pamphlet in America, and is worth reproducing almost *in extenso* as far as the review of it is concerned.

In the *Journal of Forestry* (March 1923), published in Washington, an instructive review is given of an article by Ellen Churchill Semple on "The Influence of Geographic Conditions upon Ancient Mediterranean Stock Raising":—

It is of interest to see that this subject was of sufficient importance to be read as a Presidential Address to the Association of American Geographers. All ancient authorities are mentioned, such as Aristotle, Columella, Galen, Pliny, Theophrastus, Varro, Virgil, Xenophon, Plutarch, Cicero, Herodotus, Pindar, Diodorus, Siculus, Æschylus, Strabo, Homer, Sophocles, Thucydides, Tacitus, Hesiod, Pausanias, Polybius, Horace, Cato, Martial, and Arrian.

From these writings the reviewers state it is apparent that there is a close parallel between the climate and topography of the Mediterranean and the economic history of the stock industry. On the whole, of course, the region furnished only mediocre pasture, being worse in the east and south, which would include Cyprus. The summer drought destroyed pasturage in the lowlands from two to six months each year. In general, the upland pasture was more adapted to sheep and goats than to cattle and horses. Grazing in this region was always semi-nomadic, the mountain chains forming the summer ranges. Various pastoral people, who pushed their way into this region from without, changed from nomadism and pastoralism to sedentary agriculture and the arts.

It appears to me noteworthy that there is a distinct record that this actually took place, as many people still think that this semi-nomadic state of the pastoralist

is quite natural and can be tolerated in this twentieth century, when we have records of its being changed over two thousand years ago by economic and topographical conditions. With the far greater population to-day, how much more necessary is it to have and practise in each civilized country the highest form of agriculture under which each section of the people will be most prosperous and happy. The agricultural practice of South Africa, Australia, and California, with similar climates, lead the way to-day, when Europe began the process over two thousand years ago.

As M. Madon, the first Principal Forest Officer, says in his report, *The Replanting of the Island of Cyprus*:—

Goats.—The Island possesses 250,000 goats—those ruinous animals that make us pay so dear for their milk and other things they produce, that have stripped of all verdure Spain and Greece, that have reduced the Forests of Provence, Corsica, and Algeria to mere thickets owing to their depredation.

"We shall soon find the bare rock," says a writer on Cyprus, "where now the thickets stand, which the untiring and voracious teeth of the goats are ever baring—those insatiable rodents perched up amongst the bushes in order to reach the highest branches—what appetite they have, these eternal starvelings! They it is that achieve the destruction commenced by the hand of man. There, where the woodman's axe has laid the forest low, the nibbling of the goat prevents Nature from repairing the disaster. As fast as the young shoots show themselves in spring, goats devour them, until at last the parent stem loses all heart and refuses to reproduce them."

Even where grass flourishes the goat disdains the turf beneath him to attack the highest branches within his reach. What ravages do they not commit in our Forest of the porphyric range, where, during nine months of the year, the soil on which the Forest stands, and which can alone nourish them, is absolutely bare! The goats watch for the opening bud, for the shoot that with difficulty pierces the bark, for the young seedling that emerges from the soil, and every burst of vegetation is arrested under the unceasing action of its cruel teeth, of its poisonous saliva!

It is not possible to suppress them altogether, since they form a very important factor in the existence of the Cypriot peasant, and represent too high a value for him. We can only reduce their number little by little, by restraining them from those parts of the Forest to which they have hitherto had free access, and above all by augmenting the tax on them and lowering that on sheep and oxen.

It will be a difficult thing to induce the inhabitants to give up the ways to which they have been accustomed for centuries, to make them understand the measures that are necessitated by the general interest, by foresight, by responsibility, all of which are matters quite beyond them. They will therefore resist every attempt at amelioration, and often one will have to turn a deaf ear to their complaints.

M. Madon's concluding remarks in his report deserve to be borne in mind, as the shepherd still holds sway to the detriment of the people of the Island and their future prosperity.

Summing up: The Forests of the Island are in a deplorable state; their ruin is hastened from the fact that the action gets more destructive on account of its yearly being concentrated on a narrower area. There is no more time to remedy the situation by simple remedies—only energetic measures may be of some use, and there must be no hesitation in their application, as the whole future prosperity of the Island depends on this.

The limitation of Forests and the study of customary rights are the first improvements to realize, and give to the ulterior effects a solid basis. Immediately afterwards the pasture of goats and the waste of wood must be energetically put a stop to, as also the temporary culture. The danger is too great for the severity of the repression not to be justified; for in such climate, when the last Forest will have vanished (which may not be very long), no efforts, no sacrifices, will be able to re-establish or restore them, and the injury will be incurable.

(*Signed*) M. MADON.

May 15, 1881.

In an extract from the late Sir David Hutchins' *Report on Cyprus Forestry*, the following sums up the position in the past:—

GOAT-GRAZING AND FORESTRY IN CYPRUS

When the British Government took over the administration of the Island of Cyprus, the evil of goat-grazing and the necessity of restoring the Forests were admitted on every side. Forest Laws were enacted and the legal position of goats in the State Forests clearly laid down. Goats at that time swarmed in the Island. Relative to the number of inhabitants there were more goats then, than now. Officials, travellers, and writers of various shades of opinion refer repeatedly to the magnitude of the goat evil in Cyprus.

M. Madon described the goat evil in Cyprus thirty years ago, writing from the point of view of the Forester. Mr. C. Reid describes the goat evil of to-day in Cyprus, writing barely a year ago, and from the point of view of the hydraulic engineer, Mr. Reid denounces the goat as emphatically as did M. Madon:—

This mischief—erosion and winter flooding—is due mainly to the enormous herds of goats which destroy the young trees. The locusts destroy the vegetation for a single season: the goat destroys the vegetation permanently; but as it does not cause an immediate famine with the hand-to-mouth system of agriculture in vogue in Cyprus, the mischief passes unnoticed. We have mastered the plague of locusts; it now remains to deal with the goats.

If the goats can be removed before it is too late, vegetation will again clothe the hills, bind the soil, and equalize the flow of the water.

OUST THE GOAT WITH A HARDY COW.

It is extraordinary that in Cyprus goats have so completely usurped the place of cows. Some years ago milch cows were practically unknown in Cyprus. Even now milch cows only exist at Nicosia and a very few other places. There are not a hundred milch cows in the Island. It is said the country is too dry to keep cows successfully, but that is not so. Hardly any attempt is made to grow cow fodder. Lucerne, with the general prevalence of lime soil and marls, grows as it does in lime-country in South Africa, but is almost non-existent in Cyprus. In fact, lucerne grows well and cows thrive in Cyprus; but little lucerne is grown and few keep cows, while goats overrun the country. Yet, as a producer of milk, the goat is a less profitable animal than the cow.

CHAPTER III

EDUCATIONAL EXPERIENCES OF GOAT-GRAZING IN OTHER ASIATIC COUNTRIES

1. India

THE Indian Forest Service to-day is one of the most progressive in the world. Its early history reveals the untiring and incessant efforts made to overcome the destructive practices of the aboriginal tribes in India. The grazing problems with which it was confronted subsequent to its inauguration appeared to be insurmountable, but by prodigious efforts control was eventually established. Professor E. P. Stebbing, late of that Service, now Professor of Forestry at the University of Edinburgh, gives the following descriptive account of the grazing question:—

It must not be thought that with the institution of Forest conservancy in India there was any idea of excluding the enormous numbers of cattle, sheep, and, worse still, goats, which had from time immemorial grazed in the Forests and waste lands at the will of their owners, and free from any restrictions. Had the idea been entertained it would have proved impossible of achievement. The same state of affairs existed for many centuries in Europe, and accounts for the bare slopes on precipitous mountains and hills in the Alps, Pyrenees, Greece, Macedonia, and elsewhere. But the damage had, in most cases, been done, and the Forests, and subsequently the flocks, had long disappeared before the advent of the scientific Forester in the West. In India, when the Forester made his appearance, the practice of cattle-grazing in the Forest was still in full force, and was regarded as indispensable. It is true that many fine Forests had disappeared under the universal practice of grazing combined with fire, for the two were, and are, intimately

associated; but the country was very large, and the population in many parts small. Consequently no diminution in the customary grazing methods had made its appearance. With the protection afforded the people under the settled British rule, the herds and flocks had multiplied amazingly, and the demands for grazing became intensified.

It is a fact which scarcely needs insisting upon that the regeneration of a Forest is difficult—in fact, impossible—if grazing animals are allowed within the area. True, some species feed principally on grass and are not usually browsers, but when the former are absent, they will feed on the shoots of young trees, thereby destroying the latter from the point of view of their capacity to grow into commercial timber. Even when a Forest is fully stocked with young and old growth it can only yield a certain amount of grazing. If, however, in a ruined or partially ruined state, grazing is incompatible with its restoration by means of a healthy crop of young trees. In India the position was rendered the more difficult, since owing to the large areas in question and from climatic reasons, usually the only possible method of restocking areas was by means of natural regeneration, i.e. from seed falling from the trees standing on the ground. On the other hand, in the sandy and desert regions, where tree growth only occurred on the banks of rivers, and as far back as the percolation from the river reached, extensive grazing had been recognized by some native rulers (e.g. in Sind) as impossible. It is true that the Amirs of Sind (*I.P.* 279) used these areas for hunting purposes; but they realized the fact that closure to grazing by fencing was necessary in order to maintain a Forest growth. These being the considerations which governed the policy with reference to the restriction of grazing, it will be obvious that the question had to be handled with extreme care. It must, of course, be understood that the goat is the worst browser of all the animals.

The foregoing account should leave no doubt in the reader's mind of the harmful effects of grazing. It describes the difficulties with which the Forester has to contend, and shows that although the grazing of cattle to a certain extent must be considered inevitable, it must be curtailed as much as possible. The importance of the remarks on the difficulty of regenerating Forests cannot be over-emphasized. The cost of

planting at the present day is almost prohibitive. The Forester is therefore compelled to rely on the assistance of Nature to restock the Forests by means of natural regeneration.

Much of what Professor Stebbing states is corroborated by the following extract from *Forestry in India*, by B. Ribbentrop:—

> The nomadic and semi-nomadic habits of a great proportion of the people of India present another difficulty with which Forest Officers have to deal, to an extent which can hardly be understood by our colleagues in Europe. From time immemorial the natives have grazed their cattle, sheep, and goats on all the waste lands and Forests, wherever it suited them. Now it is a well-known fact that a Forest in the most perfect state of production and reproduction can yield but a limited amount of grazing, and that a once-ruined Forest, or an area under production, is even more sensitive in this respect. No doubt there is more grass in Forests of the latter description, and tree-shoots are not so greedily attacked, especially when goats are excluded, but all the same the progress of restoration and regeneration is greatly interfered with. Nevertheless we have to accommodate ourselves to circumstances to strictly protect as many Forest areas as possible, and others during the most critical periods of their existence.
>
> The periodical closing and opening are arranged for under working plans duly submitted for criticism and sanctioned by Government, and the requirements of the people and the most necessary protection the Forest growth needs are duly weighed and balanced. It is in the interest of the State to utilize its Forest property to the utmost of its potential capabilities, which cannot, it is clear, be increased by proscriptions and records of undefined privileges, but which can be lowered past recovery by excessive use. Such records permitting privileges beyond the capabilities of the Forest are only too frequently the consequence of the desire to secure the utmost benefit to the surrounding population, though in the end the effect is quite the opposite. Larger temporary benefits can naturally be conferred if the capital is drawn on as well as the interest.
>
> There is no fear that the burden will ever increase, for it has already been observed in several localities that a general advance

in agriculture, which doubtless is taking place in some parts of India, lessens the demand for Forest grazing.

In a marginal note, which the late Mr. A. K. Bovill (Principal Forest Officer up to 1920) wrote on the last part of this extract, he states: "Not so in Cyprus, for the advance of agriculture sends the goats to the Forest and does not reduce." I am sorry to say that I have noticed the same thing, and this fact is sadly brought out by the figures of goat-grazing in the Forest: whereas 9·74 per cent. were grazing in the Forests in 1906; in 1924 and 1925 this was increased to over 21 per cent.

Extract from the *Administration Report of the Forest Department of the Madras Presidency* for the year ending March 31, 1924:—

The following table compares the Forest offences of all kinds reported during the year with those of the previous year:—

	Unauthorized Grazing
1922–23	.. 1,636
1923–24	.. 2,161

H. TIREMAN.

PROTECTION FROM CATTLE

One-fifth of the total area of Forests was closed to grazing during the year 1923–24, while about one-fourth was closed during 1918–19. The number of animals grazed increased from 2,045,678 at the beginning of the period to 2,141,770 closing year; one animal to 4·59 acres is quite sufficient, and shows a better proportion than in Cyprus with one animal to 2·2 acres. Over an area of 4,973 square miles of Reserved Forests no goats are allowed to graze.

From the *Report of the Forest Administration in the Presidency of Bombay* it is interesting to read that only

22 per cent. of the Forest area was in 1923–24 open to the grazing of all animals; whereas a larger area was open to all animals, except browsers, which included goats, sheep, and camels.

The following extract from the *Annual Report of the Forest Administration in Ajmer Merwara* for the year 1920–21 reveals conditions closely resembling those prevailing in Cyprus:—

> Grazing—especially illicit grazing—is a great nuisance all over these Forests. It is another cause of the poorness of the production. Strictness by the Forest Staff at once results in serious and exaggerated complaints from the villagers to the Commissioner, which make the Forest Staff reluctant to interfere.

It is so apposite that it might have been written about Cyprus. From this report it is also interesting to note that beyond a large number of buffalo and oxen, the other animals numbered 83, which even if they were goats would be a negligible number for a Forest area of over 90,000 acres.

The following extract from the *Progress Report of the Forest Administration in the Punjab* for the year 1923–24 testifies to the regard paid to the requirements of the people:—

> The question of the amount of browsing that can be safely allowed continues to receive the close attention of the Department. The percentage of areas entirely open to grazing and browsing animals has increased, but care has to be taken to see that the wishes of the people in this respect are met without undue sacrifice to the interest of Forest reproduction.
>
> In Hoshiarpur seedlings were again noticed in considerable numbers; as usual, however, they were soon destroyed by grazing, which could not be restricted.

Both of these statements might have been written of Cyprus in any year with regard to grazing and the destruction of seedlings.

From the *Annual Progress Report of the Administration in Ajmer Merwara Forest* for 1923–24 the following is taken:—

The rates of grazing fees for non-right holders were doubled in 1920–21, and this brought in a revenue of about Rs. 9,000 more than in the last quinquennium, or a gross increase of 50 per cent.

Also it looks familiar to notice that out of 1,302 cases taken up, no less that 728 were for unauthorized grazing. It is interesting to find that the value of the forage obtained by grazing is appreciated by the people.

No spot on earth is apparently safe from the shepherd, as the following extract from the *Indian Forester* shows:—

Notes on a visit to the Pindari Glacier.—The Sarju Valley is largely cultivated, though here and there the chir pine Forests come down close to the river, and as the south side of the main watershed ridge has been largely denuded of Forest by village graziers, good Forest is only reached after crossing into the Pindari basin.

The following is taken from the *Review of the Forest Administration in Burma* during the five years 1919–20 to 1923–24:—

Protection from Cattle.—The incidence of grazing in reserved Forests is not serious except in the dry zone. Grazing is, however, a distinct menace in areas under regeneration, but it is understood that the measures taken against it in such areas are sufficient.

Most of the Cypriot Forest Staff would be profoundly thankful if their report were the same as the last part of the quotation above.

From far-off Baluchistan the following extracts from the *Report of Forest Administration* for the year 1923–24 sound familiar:—

Illicit Grazing.—The number of Forest offences has risen from 606 in 1918–19 to 701 at the end of 1923–24. The increase has

chiefly taken place under the heads of illicit grazing. The chief object of Forest policy aimed at in this province is to preserve the few existing Forests, and thereby prevent denudation. The Forests are administered for the public benefit. The local population is supplied with timber for building and agricultural requirements, wood for fuel, grass and grazing for their cattle. Revenue collection is of minor importance, and is subordinate to the public welfare. The reservation of the Forests does not aim at any profit to the Government, but at checking destruction by regulating the rights and restricting the privileges of users.

Proportionately more damage is caused, and, as the prohibited areas are practically negligible, it cannot be checked.

There are many lessons to be learnt from other countries, so that it is thought advisable to quote from the reports of countries with similar climates and economic conditions to those prevailing in Cyprus.

2. In the Indian Ocean: Mauritius

In an extract from *British Empire Forestry Conference, Canada*, 1923, Statement of Forestry in Mauritius:—

Planting of Waste Areas.—Special legislation has been found necessary against stray goats and fowls and pigs.

It is obvious that in Islands, with their smaller areas, much greater care has to be taken to preserve plantations or Forests from grazing.

In the Forests themselves apparently no difficulty is experienced with the grazing of animals, which feed outside on agricultural lands.

3. Syria

The following note from H.B.M.'s Consulate-General, Beyrout, supplied by the Department of Overseas Trade (*Empire Forestry Journal*, Vol. III,

No. 2, December 1924), describes the measures which are being taken to afforest the Lebanon area:—

Two Decrees intended to bring about the afforestation of the Lebanon have recently been issued by the Governor of the State. The first of these deals with afforestation properly speaking, and may be summarized as follows:—

The expense will be divided up among the inhabitants and collected in the same way that taxes are collected.

The State can forbid the felling of any kind of tree considered necessary for the public good. The Department of Agriculture can declare closed to all kinds of animals any areas which are either wooded or suited for afforestation, and to exclude from such areas cattle belonging to the owner of land within it.

No cattle may be pastured in private woodland, orchards, etc., without the owner's leave. If the land is in a reserved area, the owner's leave must be endorsed by the Department of Agriculture.

The other Decree referred to, raises the tax on goats to forty Syrian piastres per animal, with the object of discouraging the inhabitants from keeping these animals. The report also states that—

A further somewhat lengthy Decree has recently been issued regarding the appointment of Field guards, their duties and their remuneration. One of their duties will be in collaboration with Forest guards, who are apparently to be appointed to see that Decree 2661 is enforced.

In view of the considerable extent of afforestable land in the Lebanon district, the action of the French Authorities, as described above, is interesting.

Special attention is drawn to the fact, well known to Forest Officers, that the goat is the natural enemy of the young tree, and so a higher tax can help to repay the damage caused generally.

CHAPTER IV

EDUCATIONAL EXPERIENCES OF GOAT-GRAZING IN EUROPEAN COUNTRIES

1. Great Britain: England and Scotland

Although the Charta Foresta of 1225 was necessary and epoch making, goats never darkened the Forestry outlook in any part of the country.

Grazing is still practised, but for the most part in fields specially set aside for that purpose. Then, too, in a climate such as Great Britain with its higher rainfall, grass grows much more prolifically than in Cyprus, and thus it is easier to keep animals. On the other hand, Cyprus has a distinct advantage in the growing of fruit crops, such as raisins, sultanas, and oranges, which cannot be grown in the open in England.

There has been a great deal of controversy in England in recent years as to the advisability of afforesting some of the rough grazing areas with the object of providing for part of her future requirements in timber. There are many million acres either devoted to sport or grazing. Mr. Acland's Reconstruction Sub-Committee calculated that if an additional 1,770,000 acres were afforested to secure the country against timber famine in the event of war, the meat yield would suffer a comparatively slight reduction. A statement was also made to the effect that if there are 4,000,000 acres of the poorer type of grazing land not utilized to the best advantage in the British Isles, it would not be difficult to imagine the amount of grazing land in the

Empire which had not been fully developed. To quote an extract from the *Proceedings, Resolutions, and Summary of Statements of the British Empire Forestry Conference of* 1920:—

> Without overstating one's case, one can say without fear of contradiction that the world's timber situation gives grave reason for thought and inquiry. We are informed by leading periodicals and other authorities of a world paper shortage; we read in the report of a recent American Commission that timber is being cut in the United States at three times the rate of growth; that a shortage has begun, which will become increasingly acute for several decades.

Thus in England and Scotland, where civilization is in a very advanced stage, it is being acknowledged that it would be more profitable to afforest the poor grazing areas.

In the year 1919 a Forestry Act was passed whose objects were two-fold:—

> 1. To provide a reserve against the time when the exhaustion of the virgin Forests of the world begins to be acutely felt.
> 2. To secure increased employment and increased production which follow the conversion of waste land or poor pasture into Forest.

They speak for themselves.

Grazing *versus* Forestry has been much studied as an economic question, particularly with regard to the great social question of rural depopulation. The following conclusion was reached:—

Forests give ten times as much employment as sheep farms of the same size, without reckoning the population absorbed in the attendant industries, which in many cases trebles the ten times ratio.

The damage to Forests and plantations in the British Isles is mainly caused by sheep and other cattle. Goats are disliked; the damage they cause is

understood, and, in consequence, they are not kept in large numbers. Generally it may be said that animals are grazed in open pastures, rendered possible by the abundant growth of grass, but still precautions have to be taken to protect the Forests and plantations by fencing. The following extract from the *Forester*, by J. C. Brown, deals with this question:—

It may not be out of place here to state the great necessity there is for keeping good all fences which surround plantations, to a period beyond that at which it is likely that the trees will be injured by the access of sheep and other live stock; and especially, as I have often had occasion to remark, the evil effects of sheep, in particular, being allowed to have access to plantations at an early period, I find it the more incumbent upon me to point out the evils arising from such a habit being allowed upon many estates.

Upon many gentlemen's estates I have observed sheep and other cattle grazing in hard-wood plantations not above twenty-five years old, and this was allowed under the impression that the rent which was received for the grazing did more than any additional benefit which could be derived from an opposite system of preserving the trees by fences. This, however, I beg to say, is a practice very injurious to the welfare of any young plantation; for sheep, in particular, when allowed to have free access into any plantation composed of trees in a growing state, and having their bark smooth, are certain to injure the same, from the greasiness of their wool coming in contact with the bark and impeding the action of light and air. Under such circumstances I have frequently had occasion to see many fine and apparently healthy trees die suddenly. Upon the other hand, heavy cattle, when allowed to graze in a plantation of small extent among growing trees, are always inclined to hang about under their shade in the warmer part of the day, at which periods they invariably commence gnawing the bark (which is smooth on such young trees) as well as the shoots of the tender branches when they can reach them. Therefore I would advise all proprietors, as they value the welfare of their plantations, never to allow cattle of any description to have access into a plantation unless the trees in it are considerably advanced, when the bark of most Forest trees becomes hard and covered with rough, scaly protuberances, which resist the action of either greasiness of the

sheep or the teeth of large cattle. It may be asked at what stage would it be safe to allow the grazing and cutting to take place where trees are? In answer to this I give it as my opinion that when trees have attained the age of nearly forty years, and have received their final thinning, in the generality of cases they may be considered safe from the inroads of cattle.

The above account describes the damage resulting from grazing sheep—animals which cause much less damage than goats—in young plantations. It is interesting to note that goats are not even mentioned in connection with the matter, as everyone had an intelligent idea of the damage such an animal would cause if it were allowed in a wood or plantation.

A later-day war experience in Great Britain is, I beg to submit, most instructive from the point of view of grazing in their relation to Forests in any country.

The following is taken from Lord Lovat's opening address in the *Proceedings, Resolutions, and Summary of Statements of the British Empire Forestry Conference of* 1920 issued by the Forestry Commission, London, 1921:—

Importance of Forests.—If we look at the other side of the picture: In Great Britain there are many millions of acres devoted to sport or carrying not more than one sheep to four or five acres. Much of this land is so unhealthy for stock as not to be able to carry the younger stock in winter. Commissions and Departmental Committees have investigated the yield from this poor grazing land, and as far as can be gathered from the 1873, 1882, 1892, 1908, and 1916 Reports, it is probably true to say that there are approximately four to five million acres in the British Isles which are either incapable of producing, or are not actually producing, more than two pounds to three pounds of mutton, and rather less than one pound of wool per acre per annum.

Probably not more than one-third to one-fourth of the total grazing area is suitable to tree growth, but admitting this, and admitting also that, if the low ground were granted, the high ground would be thrown out of gear and only available for summer grazing,

it is certain that an extension of the planting area would greatly benefit the general community.

The following comparisons between an acre of land under sheep and an acre of land under trees are important:—

(1) Continental experience shows that during the planting period 100 acres, and during the productive period 50 acres, of Forestry land gives employment to one man. Hill grazing of the nature described gives employment to one man to about every 1,500 to 2,000 acres.

(2) Forestry gives throughout a coniferous rotation 50 to 100 cubic feet (depending on soil, altitude, species, etc.) of timber per acre per annum as compared with two to three pounds of mutton and less than one pound of wool.

(3) With regard to saving of tonnage, we are importers of mutton, wool, and timber—the proportion is as 600 to 800 to 1 in favour of the timber crop.

(4) The value of the annual yield depends on species and length of rotation, but at average prices would be not less than 10 to 1 in favour of a timber crop. If we divide these results by four, that is to say, if we admit that one acre in every four acres of moderate hill grazing is suitable for growing commercial timber, and allow no value for hill grazing above the planting line, and allow no advantage to count from shelter given by plantations to grazing after the trees have reached a certain height, we are still left with the fact that the benefit to the community of planting second-rate grazing is still greatly in favour of Forestry.

Here is an old civilized country acknowledging that it is more profitable to plant up poor grazing areas with trees than to leave them as such. This is incidentally an example of the opposite practice which has been considered the best method of conducting Forestry operations. No one in England suggests opening the Forests to grazing nowadays, yet the demand for grazing is immense. It is met by farming on up-to-date lines with regular pastures, on which the cattle are grazing at certain seasons of the year, and are receiving attention, rest, and manure according to proper farming methods.

Again, the same point, amongst others, is stressed of

converting waste land and poor pasture into Forests, thus giving greater employment. There is no question of grazing in the State Forests or plantations.

The old Scottish custom of the renter of grazing fencing in the area shows not only the value of the grazing, but the desire to do the least damage to trees or agricultural land. The following extract by Captain Campbell Walker, F.R.G.S., Deputy Conservator of Forests, Madras, headed "Self-sown Fir and Larch," contrasts the conditions obtaining in Great Britain and India:—

Grazing.—I made particular inquiries on this point, in order to ascertain the usage, as the case of this estate, with 60,000 acres under what may be called the Strathspey Forest Department, in the midst of a great grazing country, bears some analogy to the question in Madras, where every little enclosure for planting or formation of reserves is apt to be met with an outcry, as lessening the extent available for pasture. I have invariably argued in India that not only did our enclosures make no appreciable difference in the enormous extent of hill pasture available, to which they bear, and always should bear, a very small proportion, but that eventually grazing might be allowed in the plantations and reserves, and the pasture would be found to be improved. I now find that this is exactly the case here, where ordinary pasture land on the hillsides lets for 6d., and that of enclosed plantations for 2s. 6d. an acre, the one being as strictly reserved to the renter as the other.

From young plantations or natural woods all men and cattle are rigidly excluded, as well as from tracts from which a crop of timber has recently been removed, which, according to Mr. Thomson's system, are allowed to lie entirely fallow for some time. It often happens, however, that enclosures are made, or exist before the Forest Establishments are ready to plant them. In these cases the grazing is rented, and often goes a long way to pay for the fencing.

2. FRANCE

An instructive account on grazing and its control is given in the old French Code of 1669. The following

extract from it (Chapter XXXII—of Penalties, Fines, Restitutions, Damages, Compensations for loss, and Confiscations—pages 175–176, para. 10) describes the punishment awarded for breach of regulations, the grazing privileges accorded, the supervision maintained, and shows that France awakened to the necessity of conserving her Forests centuries ago. It affords interesting reading:—

The beasts found in act of trespass, or out of the places of the roads and specified ways, shall likewise be confiscated; and where the beasts cannot be seized, the owners shall be condemned to a fine which shall be twenty livres for each horse, ox, or cow; a hundred sous for each calf, and three livres for each sheep or ewe; doubled for the second time, and for the third, quadrupled, with banishment from the Forest against the herds and other guards and leaders, for which in every case the masters, fathers, heads of families, proprietors, farmers, and tenants of the houses and dwellers shall be responsible.

Chapter XIX of the Rights of Pasturage and Pannage reads:—

Art. 1.—(*a*) We permit to communities, inhabitants, and private persons designated Usagers, in the statement sanctioned by our Council, to exercise their rights of pasturage and pannage for their hogs and black cattle in all our Forests, woods, and shrubberies, in the places which have been declared by the Grand Masters on their visitations, or on advices received by them from the Officers of Maîtrises, to be capable of enclosure, and all the lands and heaths of our domains.

(*b*) The officers shall assign to each parish, hamlet, village, or community, being usagers, a particular spot of land, the most convenient possible, to which, and in enclosable places only, the cattle may be taken and guarded apart, without their intermixing with herds from other places under pain of confiscation of the arbitrary cattle and of fine against the usagers, and privation of office against the officers who may permit or suffer the contrary to take place; and all deliverances thereanent shall be made without expense or any claim of dues, under pain of charge of exaction.

(*c*) The declaration of the locations, and of the liberty to send cattle there, shall be published after sermon in the morning Mass of the usager parishes on one of the Sundays in the month of February, and the Sergeant of his diligence shall be lodged with the Registrar of the Maîtrise and enregistered there free of expense; all with prohibition to the usagers and to all others to send their beasts to pasture in other places, under pain of confiscation and deprivation of their right of usage.

(*d*) All the animals belonging to the usagers of the same parish or hamlet having right of usage, shall be marked with the same mark, an imprint of which shall be lodged at the registry before they can be sent to the pasturage; and every day they shall be gathered together in some one place, which shall be designated for each burgh, village, or hamlet, and shall be driven in one herd, by one way only, the most fit and best fenced, which shall be designated by the officers of the Maîtrise, without their being permitted to take any other route in going and returning, under pain of confiscation of the beasts, and an arbitrary fine against owners, and exemplary punishment against the herds and guards.

(*e*) Private persons shall put a bell on the neck of their beasts, the sound of which may give notice of where they are, and if doing damage, that the herdsmen may run after them, and the guards may seize animals wandering and doing damage, out of the place designated and declared fencible.

(*f*) The inhabitants of usager houses shall enjoy the rights of pasturage and pannage for the beasts kept for family benefit alone, and not for those of which they make trade or traffic, under pain of fine and confiscation.

The present French Code is based upon it. Special note should be taken that as far as the southern half of the country was concerned, the French people were dealing with a dry climate similar to Cyprus, but less extreme and with more rainfall. Despite this fact, the grazing is rigorously regulated and has been from the seventeenth century. If, as many goatherds assert, grazing did no harm to the Forests, how is it that a wise and modern country, such as France, long since adopted restrictive measures, as far as grazing is

concerned, simply for the better preservation of the Forests? One great point is very clear from this old law. The intention and the practice was for grazing to be allowed for one person's domestic requirements and not as a business. This is apparently how it was originally in Cyprus. It was not intended that hundreds of people should make a business out of grazing in the Forest. This is the cardinal basis of all usufructs in the Forests. It is a concession to the people personally who live nearest to it, but not that they should be benefited at the expense of all by raising animals extra cheaply in order to be able to undersell other people who lived farther away and had no usufruct of the Forests.

In the following a lurid picture is given of the destruction of the Forests of the French Alps by grazing especially. It is taken from *Reboisement in France or Records of Planting of the Alps, the Cevennes, and the Pyrenees with Trees, Herbage, and Bush*, by J. C. Brown. The passage reads:—

> And many have told me that they have lost flocks of sheep straying in the Forests of Mount Aurox, which covered the flank of the mountain from La Cluse to Agnères. These flanks are to-day as bare as my hand. . . .
>
> There, after the destruction of the Forests, have come also the grubbing-up of roots and the pasturing of flocks. They grubbed up the grounds nearest to the dwelling-places. They let the flocks go freely, wherever it was convenient or impossible to transport the ploughs. This proceeding—begun centuries ago, accelerated by the Revolution—has produced its inevitable fruits, and the inhabitants suffer sorely to-day from the improvidence of their fathers.

Mr. D. Brandis, in a *Supplement to Reports on Forest Management; the Forest in Levrier in Jura*, gives the following description:—

> Around the Mont d'Or itself, from the summit of which there is a magnificent view of the whole chain of the Swiss Alps, the Forests

cease entirely. Pasture and stunted bushes take their place. Large herds of cattle, however, during the summer months find admirable grazing all over the plateau, and an immense quantity of the cheese, for which Jura is so celebrated, is made and exported every year. In its Forests and in its pastures, indeed, consists the whole wealth of the country.

Generally, it may be said, grazing must be strictly prohibited on the slopes of mountains, owing to the difficulty of restoring Forests once they are destroyed. Steep slopes should be kept covered with tree-growth and protected from grazing. The plateaux in this region form the typical grazing areas. There are no plateaux in Cyprus. The Forests on the southern range of mountains exist on the most precipitous slopes: their removal results in the formation of rocky screes.

An enlightening account on the measures adopted to protect French Forests from grazing is given by M. Ch. Broillard in his *Cours d'Aménagement des Forêts*, 1878:—

In certain regions the administrators of Forests have to keep a record of the pasturage which is done in the Forests. It is, in general, without any advantage to the groves of trees of broad leaves in the plains of France, where wood production is valuable and agriculture advanced. This would be arranged a little by means of an agreement for the maintenance of the cattle, which are so miserable. Therefore the main grazing is done in the Forests of resinous trees on the mountains. Before anything else, we must distinguish here between the pasturing of sheep, goats, and cattle, and horses, donkeys, and mules.

The first is the cause of the greater destruction of mountain Forests. Sections 78 and 110 of the Code dealing with Forests interdict them in general meaning in Forests, which are subjected to the control of Foresters. Exceptions are allowed for the sheep, but not for the goats.

The results of the latter are much more regrettable than those of sheep. It is therefore necessary, in the interests of both private and general, to arrange for the suppression of the pasturage of sheep

in the Forest. It is only necessary to regulate this by a general rule. The Forest of the mountains and the sheep are incompatible.

But in any case there is room to limit the number of animals allowed to graze in order that the ground be not pressed down and denuded and the trees attacked; even after eating herbs (grass) it does not suit to allow more than one cow per acre of protected places. This rule is in the interests of both cattle and Forest.

The Forests are not self-protective, until they attain the age of forty years; otherwise there is reason to close the area to pasturage, until the time comes for the exploitation of timber, after twenty years at least.

Consequently it is necessary to adopt long struggles in the Forests where the pasturing is carried on. Within 50 years since the protection was imposed, the Forest will remain open for 50 years; in the course of the 100 years only if the struggles are for 150 years, then for 100 years; if it is for 200 years, then it should be open for 150 years. The thin places or the vegetations which are in bad state do not improve as long as pasturing goes on. It is the most usual cause of the thin places in the Forest. The state of the public places for mankind or for the animals is the most detestable state for the Forests. It is therefore necessary to relieve, by means of a permanent prohibition, the places which are naturally thin or in a critical state, such as the precipitous slopes, and land covered by rocks; the animals do not like the highest parts of the Forests.

Pasturing is not permissible in a selection Forest, which should be constantly regenerated with trees of different ages.

The creation and the maintenance of the areas adjacent to Forests, which will be the means of saving the Alps (mountains demand analogous conditions), to be placed under sufficient protection for a long time, and supported by ravines, by enclosures or banks of earth, by substituting cows for sheep, by limiting the number of animals, and at least to allow a temporary rest to the soil and grass by intervals.

The following extract from the *Preparation of Forest Working Plans in India*, by W. E. D'Arcy, bears chiefly on French conditions, as also on the Indian:—

It may not be out of place to indicate briefly the legal restrictions imposed in Europe, where the subject of grazing has long received attention. Taking France as an example, the Regulations

regarding grazing, contained in the Forest Code of 1827, date from a very distant time. In 1541 Francis I revived the Decrees on this subject, and these were again sanctioned in 1669 in the celebrated Forest Ordinance of Colbert. The present Forest Regulation on the subject is merely a repetition of these ancient laws.

The most important provision in the old laws consisted of the power to close to all grazing for a definite period certain portions of a Forest, or even the entire area, if such a measure appeared necessary for the safety of the Forest. The introduction of goats is absolutely prohibited, notwithstanding any title to the contrary. The same restriction is placed on sheep, but, in cases where there are no other means of providing for their support, the Government may permit cultivators, living on the borders of the Forest, to pasture their animals in the portion open to cattle-grazing.

As regards animals other than sheep and goats, the Forest Officers fix the number that may be grazed each year, and the period during which grazing may take place. This number is necessarily proportionate to the area thrown open. Right-holders are allowed to graze animals required for their *bonâ fide* domestic purposes, but not animals kept for trade or speculation. In order that the Forest Guards and the Inspectors may be able to recognize them, all animals entitled to graze in the Forest are branded.

The shepherds appointed are directly responsible for breaches of the Regulations, or for injuries done by the animals in their charge; and, if fined, the commune appointing them is responsible for the payment of the fines.

It is provided by Article 119 of the general rules made under the Law that every year the local Forest Officers shall, having due regard to the nature, age, and situation of the trees, report in a formal written proceeding the condition of the blocks of Forest under the *régime Forestier* which can be made over for grazing. They are to indicate the number of animals which can be admitted to these blocks, and the dates on which the exercise of the rights of usage may commence and must end. The proposals of the Forest Officers are submitted for the approval of the Conservator before February 1st in each year.

There are very severe penalties for a breach of any of these grazing rules. Right-holders introducing goats or sheep are subjected to a double fine. Right-holders who introduce more animals than they are entitled to, or who graze in closed portions of the Forest, are

treated as if they had no rights and are subject to the same penalties as if they were outsiders.

In translating the original text, much of the French emphasis on the damage by grazing is lost, nevertheless the meaning is quite plain, and shows the care and attention which the French people have bestowed on their Forests.

These extracts do not require amplification. They show completely, and to the exclusion of all doubt, that grazing can only be supported under certain conditions. It must be understood that although sheep are mentioned frequently, the animal which inflicts most damage on the Forests is the goat. In Cyprus the reafforestation which is so necessary cannot be effected with hope of ultimate success while the number of goats permitted to graze is so large. The following extract from the translation of an article on "Certain Advantages in the Reafforestation of the French Lands" concludes my chapter on France:—

The obstacle to reafforestation has been for a long time, and still is in certain places, the sheep. Of necessity one must place sections out of bounds, that is to say, suppress the pasturage of sheep and other animals on the areas one marks out for plantation. Very happily the peasant understands to-day, because he has seen it clearly proved that the planting of wood on certain portions, whilst permitting other portions to be dealt with in the creation of meadows, the culture of forage, plants, roots, cereals, etc., finally assures the sheep more abundant food than he found on the barren waste.

The farmer can thus manage, in suppressing grazing on the portion of the area he afforests, to assure himself of the food necessary to support flocks of sheep three times more numerous than he could maintain before.

Although only sheep are mentioned, yet the same applies with double force to goats. It is a factor in reafforestation which the people of Cyprus must realize if progress is to be rapid and without the usual opposition by some graziers.

3. Germany

Germany was one of the first European countries to recognize the importance of Forestry. The factors which exercised injurious effects on plant growth were studied by scientists, who had specialized in one or other of the branches of Forestry, and who published invaluable records on research work for the guidance of the less experienced Forest Services. Protective measures against the injurious effects of grazing were among the first precautions taken for Forest conservancy. Control was so steadily and regularly exercised as to exert an educational influence on the animal owners and herdsmen.

The following extracts from *Reports on Forest Management*, by Captain C. Walker, D. Conservator of Forests, Madras, published in 1873, adequately describe the conditions prevailing at that time:—

> No more analogous position to that which we are now in, and no better guide for settling matters justly and to the best advantage of all parties concerned, can be found than in the history of the progress of State Forest Administration and legislation in many of the German States.
>
> There is, of course, a staff of watchers, and punishment follows detection; but considering the extensive area and consequent comparatively small chance of detection, it must be something else which exercises a deterrent effect, and I am inclined to look for it in the knowledge that the whole question has been thoroughly inquired into and settled, and the Government or its Forest Officers will not exclude man or beast unless absolutely necessary for the good of the Forests, of which all classes have learnt to know and appreciate the value.

It is desirable to invite special attention to the last three lines. In Cyprus this has been the constant endeavour for over fifty years. I leave to the Cypriot readers to judge if the last part is yet true. Forest

Officers in Cyprus have endeavoured for fifty years to meet the requirements of the shepherds without jeopardizing the welfare of the Forests. Restrictions were enforced only when absolutely necessary.

The other extract referred to shows that in Saxony the privileges were done away with in the early days of Forest Administration:—

The Commutation of Rights and Servitudes in Saxony.—The Law which provides for the abolition of all servitudes is dated March 17, 1832. But before going into it fully the Act or Mandate of 1813, of which it forms an important part, should be studied. This Mandate, dated July 30, 1813, was a forerunner to the Act of 1832, and in a certain measure cleared the way for it. The first paragraph says

> "that as the real and essential object of woodlands is the production of wood, the secondary products (*Nebennutzungen*) must be so curtailed as not to interfere with the primary and chief product (*Hauptnutzung*)."

The secondary products named are grazing, pasture, collection of leaves, grass, and litter, juices of the trees and berries, and other fruits.

Paragraph 5 provides that the rights of the commoner shall be restricted to his own personal and domestic wants, so that no trade can be carried on in products he draws from the woods.

The passing of the Forest Law of 1879 and the Delimitation Law of 1881 in Cyprus were effected with the intention of reserving the Forests for the production of timber and fuel, of determining the usage to which they were subject, and of providing for the domestic wants of the villagers residing in their vicinity. Every claim which any man then had was examined, and allowed or disallowed at the time. Considering that forty-four years have elapsed since several of the Forests were delimited, there are now very few people who even remember the time, but on the other hand the Forest Department has complete records of all claims made then and settled.

From old and recent reports, and my own experience and knowledge of the country (Germany), it is clear that goat-grazing has never been tolerated in the State Forests, but only small numbers of other animals, such as pigs, in the oak or beech woods. A few cattle and other animals are occasionally allowed to go into private plantations, but in general it can truly be said that the Forests suffer no damage on account of grazing. The result is that the Forests yield increasing quantities of the much-needed fuel and timber for the inhabitants, as well as make a large direct return in money into the public treasury. At the same time the Forests yield all the indirect benefits in the conservation of the water supply, water powers, moderation of climate, and improvement of the soil. By Nature Forests fulfil this function, and in Germany man has improved and extended the natural system.

4. Switzerland

Although some of the details may not be correct to-day, yet the following extract from Sir David Hutchins' report on *Cyprus Forestry* throws a clear light on the sure instinct of the Swiss people to conserve their Forests properly from the earliest times. Also it is plain that the policy was carried out without fear or favour for the benefit of the whole community:—

Switzerland is a democratic country. The Central Government is weak; but the Central Government is stern, strong, and autocratic when it comes to dealing with grazing on the mountains.

Switzerland had systematic Forestry before most of the other European States. The first Forest Ordinance of Berne was issued six hundred years ago. In 1857 provision was made for reforesting the Alps; in 1876 the Bund assumed supervision of the water and Forest policy in the High Alps above a certain elevation. Since 1898

the Bund has supervised this work, and in 1902 the present Forest policy was finally fixed by a revision of the existing law.

Where Protection Forests can be created by planting, this may be ordered, and where Forests are converted to farming land or pasture, an equal area may be ordered to be reforested. Where barren ground is required to be forested for protection purposes, the Bund assists by paying from 30 to 50 per cent. of the cost. Between 1876 and 1902, 16,000 acres were reforested at a cost of about £200,000, the Bund paying one-half.

Grazing has been regulated for centuries. In "Protection Forests" it is entirely prohibited, but on all the rest of the Forests great success has attended the efforts of the Forest Service to safeguard both pasturage and the Forest by supervision.

Forestry in Switzerland, where every foot of agricultural land is of the greatest value, has made it possible for the people to farm all land fit for crops, and so has assisted the country to support a larger population.

Goats are seldom seen in the Forests. The cattle are allowed to graze only on the regular mountain pastures, termed "alms," or "alps," during the summer. These, furnishing some of the richest grazing areas in the country, were originally chosen because of their comparatively level surfaces and freedom from rock outcrops. Sheds and fences were gradually erected on them for the cattle.

Excessive animals were excluded. The conservation of land and its produce became the axiom of the Swiss shepherd, as he recognized that abuse of these areas would end in disaster.

The constant care taken in managing the surrounding Forests and the control and supervision of the grazing areas have been attended by beneficial and permanent results. The individual shepherd or cow-

herd has learnt that it is part of his duty to co-operate in maintaining the productivity of the alps in the interest of the whole community. The Government, for its part, looks after the Forests with the help of the Cantonal authorities. No shepherd has been known to fire a Forest to improve the grazing.

The Forests of the High Alps, as has unfortunately been the case with other European Forests, have been destroyed by excessive grazing.

5. Austria

Similar conditions prevail in Austria. On restricted areas of good land in the Alps small herds of highly-bred cattle (especially cows) are allowed to graze during the summer months. They are not allowed, under any circumstances, to graze in the Forests. The little "alms" or "alps" are carefully fenced in and provided with sheds to accommodate the animals at night. No Forest land has been alienated for grazing. No reports of goat-grazing in either the private or State-owned Forests can be traced.

The care and supervision of the Forests is rewarded by the automatic regulation of the water supplies. Although many of the rivers have their sources in high mountain ranges, flooding is exceptional. The Forests give employment to a large proportion of the population and confer great benefits on the country.

6. Rumania

The conditions prevailing in Rumania afford an interesting and instructive contrast. The Government, not having realized the importance of Forestry, has to contend with a serious problem concerning the mountain meadows. The pernicious practice of burning

areas of the mountain-pine type for conversion to new meadow land persists, and, though State land is also subject to this treatment, the efforts made towards the enforcement of the Law are practically negligible.

The following extract from Dengler's *Forests and Wild Game of Rumania* shows that the grazing problem has not yet been mastered:—

> As extensive as is the field management, so intensive is the bureaucratic management. In other words, whatever Forestry is practised is only practised on paper. One of the worst dangers existing in the Rumanian Forest is grazing. The Forest is sacrificed to the grazing industry, and enormous damage is resulting in the lowlands through erosion. The evil is not combated.

The spectacle of the steady destruction of the Forests is so sad as to be appreciated by most Cypriots, as similar conditions existed for centuries in the Island. It is gratifying to realize that steps have been taken for half a century to conserve the Forests, and that their condition is steadily improving.

The grazing of sheep and goats in Rumania is strictly prohibited by law in all State Forests, which are divided into climatic zones, i.e. areas supporting leafy trees and areas supporting trees of the fir type.

7. Greece

The conditions obtaining in Greece are best described in the following extracts from Professor Kontos' excellent book on the *Administration of the Forests of Greece*:—

> When man passed from the hunting and nomadic mode of life to the first stage of Agriculture, some part of the Forest was cleared and cultivated in a systematic manner, the rest was mainly used for grazing animals and for exploitation (partly for the supply of fuel wood and technically worked timber, the demand for which began

to grow greater from time to time, especially for the Agriculturists' houses and buildings).

Under these conditions cattle-breeding could not be advanced, since the animals remained exposed to the cold winter in the open air, and they decreased in number owing to death and the people not being fully developed in individuality and race.

But Forestry could not progress much on account of the unrestricted grazing, and the Forests adjacent to the farmhouses were ruthlessly cut down.

Finally, in some of the more accessible Forests, the shepherds, who were formerly free to roam anywhere, have been restricted to certain areas, especially those grazing goats.

Thus in many parts of Greece the injurious results of the excessive animal-breeding of the shepherds are still felt, especially the damage done by goats, which have been limited for some decades, but still stop, in an indirect manner, the development of Arboriculture, Agriculture, and Forestal progress.

He further describes how the fertile pastures are being cultivated, olive-trees, etc., being grown, and how the less fertile areas are set aside for the growing of timber-producing trees. He shows that goats are now being confined to houses as domestic animals for the sake of their milk, which replaces that of the cow.

Professor Kontos contends that the policy adopted by the Greek Government is not conducive to the development of the Forestal National Finance of the country. He points out that the Government of Cyprus, by means of Law XII of 1913, which provided for the diminution of the number of goats in villages in which the majority of the inhabitants voted against their maintenance, forbids their retention within the limits of the village, with the object of improving Agriculture and Forestry. Also, he repeats part of what has been written about the French Code of 1669, and expresses the opinion that it was only by means of such provisions that they were able to save the Forests in

France. He contrasts the conditions in Greece by the following:—

> But in Greece, which Parliament or Minister of Agriculture will dare take up the contemporary measures, as pointed out both for the protection of Forests and goat-grazing in the country?

In the following extracts he deals with the injurious effects of goat-grazing:—

> The goats are much more injurious to the Forests than the sheep and cows, because the sheep and cows graze on the grass only and on the seedlings of oak of one or two years' standing, whilst the goats feed on the fresh sprouts of all herbs, bushes, and Forest trees, especially on the central top sprout of fir, oak, pine, etc. The goat often climbs in search of these sprouts, especially in the spring, when they are tender and full of nourishing substances.

He further contends that the goats impede the growth of the Forest trees and dwarf them. After referring to the excessive area grazed over by each goat in Cyprus, he concludes by stating that incendiarism and illicit felling are not the principal cause of destruction: the damage is caused by goats and sheep, which should be excluded from all the Forests of Greece.

8. Malta

Curiously, in another Mediterranean Island, viz. Malta, the goats have become notorious by helping the mosquito to disseminate fever. Foresters contend that because they have been allowed to roam unchecked, damage has been caused to the few trees which were planted—trees whose presence was essential on account of the rocky nature of the land—and the attendant difficulties of obtaining a covering of soil have been destroyed by the destructive teeth and voracious appetites of goats.

CHAPTER V

EDUCATIONAL EXPERIENCES OF GOAT-GRAZING IN AUSTRALIA

THE climate of the greater part of Australia resembles that of Cyprus, and therefore the Forest problems should be of interest to the reader. Several eminent men have studied the questions, and have recorded their ideas in books and articles in a most lucid manner. The inclusion of carefully selected extracts, it is thought, would be the best way of summarizing the position, as they are by men who made special studies of the subject.

Sir D. Hutchins, in a *Discussion of Australian Forestry*, stated:—

> The bad effect of grazing in Australian Forests is directly due to a wrong system of control. All through Australian Forests I have remarked the absence of a sufficient proportion of young trees in the "pole" stage of growth. There is usually a good reproduction from seed, particularly after a Forest fire, but other Forest fires reduce this reproduction to a patchy condition. Then, if there is grazing in such Forests before the trees are sufficiently grown up, further harm results. It is thus specially important that the regulation of grazing should be left entirely to the Forest Department, so that the grazing may be used to help the Forest, instead of destroying it. Furthermore, there is the difficult and delicate matter of getting graziers who will abstain from burning the Forest.

Mr. Mackay, Conservator of Forests, Victoria, supplies the following information in *The British Association Handbook for Victoria*:—

> The natural reafforestation (regeneration) of trees of slow growth, such as Grey-box and Yellow-box and, to a less extent, of Red-gum,

is greatly impeded by the maintenance of dual authority in connection with Forest grazing. Sheep greedily eat seedlings and stool-shoots of many species, even when grass is abundant. They thus destroy all hope of obtaining a regular hardy crop of natural growth. To this cause alone is due the absence of young pole timber in many valuable Forests where rabbits are scarcely ever seen. Every endeavour has been made, but generally without avail, to put a stop to this senseless practice of sacrificing young Forest growth to what is at the best a small grazing revenue.

An extract describing the losses in Wattle Bark due to improper grazing:—

It is shown by statistics that when the war broke out Australia was losing (in imports *plus* lost exports) some £250,000 on bark. Nearly all this loss was Wattle Bark, *Acacia decurrens* and *Acacia pycnantha*. With acacia, grazing plays an important part, much more so than in the case of eucalyptus. Acacias, and certainly nearly all the tan-bark-yielding acacias, are greedily devoured by grazing animals. A well-fed milch cow that will not touch coarse grazing will graze off acacias to such an extent as to taint the milk.

Danger of Ill-Used Tree Areas Reverting to Worthless Scrub.—A calamity which has occurred in several countries, and which is a distinct danger to be avoided, is that if a Forest be recklessly destroyed it will not give even the partial return of good grazing. In Africa very large areas of destroyed Forest have run scrub with the destruction of Forest.

The loss to the Acacia Forests, as shown by the foregoing account, has been caused by the unrestricted grazing of live stock, with the exception of goats, of which there are apparently none. One cannot conjecture, without apprehension, what the result would have been had thousands of goats been allowed to graze, as in Cyprus.

The following extract from the *Empire Forestry Journal*, Vol. V, No. 1, of 1925, speaks for itself:—

In a supplement to the *Education Gazette* of January 22, 1925, entitled "School Forestry," there is an article by Mr. Owen Jones,

Chairman of the Victoria Forestry Commission, deploring the loss occasioned yearly by Forest fires and the reduction of the Forest area by throwing it open to inferior grazing.

Report of the Forest Department of Western Australia for the year ended June 30, 1925. S. L. Kessell, B.Sc., Conservator of Forests:—

Grazing Control.—In past years considerable damage was caused by horses in the young plantations. With the object of combating this nuisance the portion of the working circle within the Mundaring Reservoir Catchment Area was declared State Forest. Powers given under the Forests Act were then used to prevent further trespass.

Fifty-nine (59) "Brumbies" were yarded. All unbranded animals were destroyed, but branded horses were released to their owners on the distinct understanding that in the case of further trespass the owners would be prosecuted.

It is strange why other people, although they use wood, cannot see that it must have a chance to grow properly in the same way as the very kine or goats. By no stretch of the imagination can the scanty forage to be found in the Cyprus Forests be described as good pasturage for any animals, even goats. The climate does not allow much herbage to grow.

The above extract is a most timely reminder that even horses do a good deal of damage in plantations. Until 1924 all kinds of animals, including camels, pigs, and horses, were allowed to graze in the Cyprus Forests.

CHAPTER VI

EDUCATIONAL EXPERIENCES OF GOAT-GRAZING IN AFRICA

1. North Africa

(*i*) *Algeria*

In the *Introduction to the Study of Modern Forest Economy*, by J. C. Brown, an admirable summarization is given of the conditions prevailing in Algeria:—

In works on Forest Science published on the Continent there abound statements relative to the effect of Forests in maintaining humidity of soil and climate.

The following more popular allusions to the effect of Forests upon the humidity and consequent fertility of a country I find amongst others cited in *Le Bulletin de la Ligue du Reboisement de l'Algérie*:—

> In felling trees growing on the sides and summits of mountains, men under all climates prepare for subsequent generations two calamities at once—a lack of firewood and a want of water.—Tomboldt.
>
> It is always hazardous to interfere, however slightly, with that which Nature has arranged by the work of time—the work of ages. There is often destroyed in a few days by man, through ignorance or cupidity, the work of hundreds of centuries.—Viollet-le-Duc.
>
> It is especially necessary in warm countries to preserve the Forests, because on the one hand they keep down the temperature, and because on the other they induce rains, without which there is no vegetation possible. The salvation of the colony of Algiers can only at this price be secured.—Mahé.
>
> By the single act of a pioneer settler clearing virgin soil, he alters the network of isothermal and isocheimenal lines (lines of

equal mean temperature, of equal summer temperature, and of equal winter temperature) over a country. One may say, in general terms, that the Forests are similar to the sea in their influence, reducing the natural differences of temperature in the different seasons, while the destruction of Forests increases the difference between the extreme heat and the extreme cold, imparts greater violence to atmospheric currents and to torrential rains, and a protracted duration to droughts. . . . Marsh fevers even, and other epidemic diseases, have often made an irruption into a district when woods, or simple screens of protecting trees, have fallen under the axe. As for the water-flow, and the climatic conditions on which it depends, one cannot doubt for a moment that the clearing away of woods has had the effect of disturbing its regularity. The rain—which the interlaced branches of the trees allow to fall drop by drop and swell up the spongy mosses upon which it fell, or trickle slowly across the dead leaves and the long, fibrous masses of the roots—flows away at once with rapidity over the soil to form temporary streamlets, in place of sinking deeply in the ground to rise again in fertilizing springs; or glides rapidly along the surface, and goes to lose itself in rivers and floods. The ground above becomes arid in the same proportion as the running waters increase below. The full river flowings become changed into inundations, and devastate the adjacent country where immense disasters follow.—ELISÉE RECLUS (*La Terre*).

In the place of the fertile fields of Cisatlantic Africa we now find nothing but plains rendered sterile by desiccation and the absence of trees.—A. MAURY (*Histoire des Grandes Forêts de la Gaule*).

In proportion as the ancient Forests disappeared, springs dried up, certain races of animals died out, and winds which were previously unknown made their appearance. The land daily loses some element of its fertility from its bosom, which continuous mutilations devastate; there come forth hosts of evil, the saddening influences of which mar the enjoyment of our transitory existence.—RAUCH (*Régénération de la Nature Végétale*).

From Madrid to Jerusalem history and geography tell the same tale—Forests given up to sheep; Forests destroyed; mountains devoid of woods; mountains devoid of life.—BROILLARD (*Les Massifs de Spain et la Disette de Bois en France*).

The members of the Congress in Algiers who have gone

through the different provinces of the colony have been struck with the state of devastation in which they have seen many of our Forests. Exploited on no settled system, left open and subjected to depredations by the natives, desolated by frequent fires, ruined by the passages of flocks of goats and of sheep which devour the young twigs and shoots, our Forests are far from yielding to the country the revenue which might be obtained from them; it is a source of wealth not yet exploited, or exploited with reckless waste, which is still worse. We have seen Forests of the Thuya in which the young trees have been literally annihilated by the goats.—CHESNEL (*Génie Civil*).

It is not war which has brought most evil upon the region of the Mediterranean, but aridity, brought on and aggravated by the reckless destruction of woods and by the excessive abuse of pasturing sheep on the mountains.—DEHÉRAIN.

The clearing away of woods—in that lies the principal cause of the arrest to which Agriculture has been subjected in Algeria.—M. CALMELS (*Génie Civil*).

With a view to preserving our nomads from utter ruin, the Administration has adopted a measure which is likely to be afterwards bitterly deplored; it has authorized the depasturing of flocks in the State Forests. Now, to let sheep, goats, and camels ramble in the woods, or rather bushy shrubberies of Africa, is to doom these to a rapid disappearance; while the Forest should be preserved as the most precious of all possessions, extended and carefully treated as the most powerful agent in promoting fertility. The clearing away of Forests, which induces aridity, appears to me to be the cause of sterility.—DEHÉRAIN, Professor in the Museum of the School of Grignon (*Génie Civil*).

It may be said that the measure of attention given to trees indicates the condition of the agriculture and civilization of a country.—MAHÉ.

On the presence of Forests on the mountains depends the existence of crops and the life of the population. Here the existence of wood is no longer, as it is on the plains, a question of convenience; it is the question of "to be or not to be."—SURELL.

In a Forest the mean temperature is always lower than it is in a denuded country; but the difference is less marked in winter than it is in summer; the maximum temperatures are always lower, and the minimum temperatures are always higher. In a Forest the reduction and increase of temperature always advances

more slowly; the temperature there, is more equal in the day and in the night, between one day and another, and from season to season. Sudden changes of temperature, if they do not last long, do not make themselves felt; from all of which we are warranted in concluding that Forests tend to keep down the general temperature of a country; on the other hand, they tend to diminish the degree of sudden changes and to avert thunderstorms.—*Rapports Annuels de Météorologie Forestière.*

The chemical action of Forests explains, moreover, the property possessed by some kinds of trees to produce a sanitary effect on localities and districts by decomposing or arresting gasiform deleterious elements.—MAHÉ.

The immense extent of the area occupied by Forests on the earth may be considered proof that Nature designed to assign to them some action in the terrestrial phenomena.—DUPIN.

Forests, waters, and prairies are the three great laboratories of Nature whence proceed all the good things which ought to minister to man's happiness on the earth. Forests manifestly, next to the sun, are of the greatest service; they seem to have a reaction on all the harmonies of the globe. Under the truly happy influence exercised by them everything prospers.—RAUCH.

By the majestic calm of its silence, by the sounds produced by its animation or its agitation, by the intensity of its verdure, and by the varied tones of its tints, by its essences or perfumes, by its pure atmosphere, by I know not what enchanting prestige, by its harmonies and by its contrasts, this sweet and mysterious society of trees which we call by the name of Forest communicates to us the most lively and most contrary impressions. The soul of the Forest seems to act upon our own and to cause it to vibrate in unison.—MAHÉ.

To give a résumé of what has been said: "The Forest occupies an important place in Nature, in commerce, in agriculture, and in hygiene. It creates soil out of everything, and breaks this up and enriches it; it equalizes and regulates the temperature and the flow of water; it is our best safeguard against inundations; it renders salubrious at once the earth and the atmosphere; it refreshes the moral and restores the physical courage in man; it gives to him enjoyment in the beauties of Nature through the splendour of its vegetation. We see in these titles to protection against the abusive treatment to which it is subjected. It is for nations, but above all for Governments, to take good heed."—MAHÉ (*Caveent Consules*).

Although other influences besides grazing are given, yet the prominence of grazing and the recurring references to it are adequate testimony of how the French people, who were then trying to bring about the Reafforestation of the country, thought about the matter.

2. South Africa

(*i*) *Cape of Good Hope*

The following extract from *The Management of the Crown Forests at the Cape of Good Hope*, by J. C. Brown, LL.D., shows the care taken of the Forests of the Cape of Good Hope:—

Initiative Restrictions upon Reckless Waste.—Each holder of a licence to cut one load of wood shall be entitled to take sixteen oxen to the Forests and to graze them on the adjacent Government or other lands, under servitude of grazing the cattle of wood-cutters, for ten days, after which period oxen must be removed from the grazing-ground till the wood is ready to be removed. The rangers will be particular in enforcing this Regulation, which should only be relaxed in the case of sickness, accident, or very bad weather, proved to the satisfaction of the Commissioner to have prevented the men from working.

The fact that private properties were loaded with a grazing servitude for the benefit of wood-cutters should be of interest to most people in Cyprus.

Extract from the report of the Honourable the Auditor-General on the regulations to be adopted for opening the Crown Forests in the District of George:—

There are some farms in the neighbourhood of the Forests upon which there is a servitude that the cattle of wood-cutters are to be allowed to graze. Complaints have been made to me by some persons, thus interested, that by the opening of the Forests their farms might be overrun with cattle and the grazing destroyed.

What was originally intended as a reasonable servitude may, from change of circumstances, become oppressive; still, the farms are

held under servitude. It may be desirable to relieve them from the abuse of servitude but not to take it off entirely, as that might injure the operations of the wood-cutters.

The Civil Commissioner concurs with me in suggesting that the pieces of Government pasture lands adjoining the Forest should be reserved for the oxen of the wood-cutters, which would relieve the farms under servitude of grazing. All trace of a Forest would become quite obliterated in half a century or less, and the ground as strong and barren as the adjoining veldt.

(*ii*) *Natal*

An impressive warning is sounded in the following extract from a description of this country by H. C. Fourcade in a report on the Natal Forests:—

The exclusion of cattle is a necessary condition in the management of demarcated Forests. Cattle, especially goats and sheep, nibble the seedlings and young trees, and it is only thorny or inaccessible portions that are proof against their attacks. The destruction of Forest abandoned to indiscriminate sheep- or goat-grazing is certain and merely a question of time.

When the old trees perish, the Forest ceases to exist if the seedlings have been destroyed as they sprang up and there is no young growth to replace the old timber.

Though it may at first appear difficult to believe that the Forests can be thus destroyed over large areas, examples have been recorded from all parts of the world, and whenever Forest conservation is aimed at, special measures are adopted against destruction by cattle. Oxen are not so destructive as goats or sheep, and under certain conditions a limited number may be allowed to graze inside a demarcated Forest. When the grass is plentiful oxen seldom browse on the young plants: this consideration should be taken into account in determining the pasturage allowable in demarcated Forest. But even oxen cannot be allowed in the section of the Forest where regeneration is taking place, and pasturage is thus inadmissible in a Forest worked by the method of *jardinage* where trees of all ages grow side by side.

It is now easy to understand why the area of Forest is small, after these centuries of mismanagement in a

climate very similar to Cyprus, as far as much of the country is concerned. It is a pity that it is so difficult for a Forester to make ordinary people understand that in Forestry it is not that which is done this particular year, but that which has been and will be done over a series of years, which causes a great change. The bad effects of excessive grazing, for instance, do not show themselves all at once in the cumulative damage which is being caused, but gradually after a period of five or ten years and the final worst effects after a hundred years.

The practice of grass-burning has been carried on for centuries by the pastoral natives of Natal; in 1495 grass-fires were already so prevalent in Natal that Vasco da Gama gave it the name of Tierra del Fuego.

3. West Africa

The following is taken from the Proceedings of the British Empire Forestry Conference held in Canada in 1923: "The General Effects of Shifting Cultivation," by Messrs. Fraser Story and R. D. Graig:—

Generally speaking, shifting cultivation constitutes a serious menace to the well-being of the country in which it is practised. Apart from the destruction of Forest wealth, as represented by timber, it not infrequently induces a re-growth of less valuable species and vegetation of a more arid type. In the "recurrent" type of shifting cultivation, pressure of population tends to reduce the rest period, and if this is carried too far, complete sterility of the soil, whether for Forestry or for Agriculture, results. This is usually accompanied by denudation of the soil and all its evil consequences. These effects may also follow in the "nomadic" type, if frequent fire and promiscuous felling and grazing take place on the abandoned areas.

It is especially noticeable that as soon as a Forest is partially destroyed, as detailed above, everyone of the community, of whatever

type, thinks that it can be used for any purpose, quite forgetting or failing to understand its chief value for timber, fuel, and water supply of a country.

(*i*) *Sierra Leone*

In this colony, quite an appreciable number of goats are kept by the villagers, but these destructive animals usually do not wander far from the village. From the rinds of various food-stuffs which the local people eat the goats find ample food, as also from weeds and other small plants growing in the neighbourhood. It is only in the more open country with the smaller rainfall and lighter Forest growth that much damage is done to tree seedlings. All cocoa and other farms are, of course, fenced in to keep out goats or other animals.

(*ii*) *Nigeria*

In the southern part of Nigeria similar conditions prevail. Although there are fifty goats or more in each village, the damage inflicted on the Forests is slight, as they are confined to the precincts of the village. Shelters are erected and plenty of rough food is supplied. No African would contemplate taking his goat to his farm, which is situated, usually, some distance from the village. Strips of "high Forest" are left at the sides of the road to protect the farms from damage by passing animals.

In the northern part of this territory, where it is customary to move large herds of cattle (including sheep, and more occasionally goats), it is compulsory to proceed by well-defined tracks or roads in order to insure that damage may not be inflicted on the farms or Forests. The cattle-breeder knows that such rules

are made for the benefit of the community, and does not transgress; he, in turn, is assured of a safe passage for his animals.

4. East Africa

(*i*) *Tanganyika*

In the *Empire Forestry Journal*, July 1924, an article on "Forestry in Tanganyika," by D. K. S. Grant, Conservator of Forests, was published. The following is an extract from it:—

It appears, however, that little success attended the Germans' efforts to stay the destruction by Masai nomads of the fine Cedar Forests on the north of Kilimanjaro and vicinity. For generations these Masai have fired the grass along the Forest edge to hasten the growth of fresh young grazing for their great herds of cattle. The fires have eaten into the dry Cedar Forest, until now little more than a remnant remains of what would have been a very valuable asset to the country.

By the beginning of the war, therefore, Forestry had not developed much beyond the initial stages of reservation and protection. These in themselves represented valuable progress, as a check had at least been placed on the frightful devastation of Forest by the indigenous tribes, that especially in the fertile highlands has been practised for centuries with impunity.

Under Teutonic discipline the native had begun to realize that Forests were better left alone, and he had become almost inured to the idea.

Extract from *British Empire Forestry Conference*, 1923, Forest Department, Lushoto, Tanganyika Territory:—

The Relationship of the State to the Forests.—Reservation under the Germans commenced only in 1906, and it took until 1915 to select, survey, and proclaim the number of Forest Reserves now in existence. Existing and obviously valuable Forests were dealt with first. Thereafter it was their aim to set aside in all parts of the country, with due recognition of agricultural claims, areas which

gave evidence of their capacity to develop into close Forests, provided they were protected from fire and damage by man and beast.

Fire Protection.—As the burning of vegetation within a Forest Reserve is an offence under the Ordinance, the damage from fire comes from without rather than from within Reserves, especially in the case of Forest areas of the plain and savannah type, being adjacent to native cultivation and grazing land, which is burnt over annually.

In all countries this is the most dangerous practice, and has gradually been eliminated in some, but all shepherds are loath to recognize that this burning cannot be practised with impunity if the Forests are to be preserved for the more important benefits of timber, fuel, and water supply.

There is also an illuminating reference to the danger from abnormal clearing and grazing in the statement prepared for the British Empire Forestry Conference, 1923, by the same author.

(*ii*) *Kenya*

Much the same applies to this Colony, except that much greater progress has been made in the preservation of the Forests from the Masai shepherds. Similarly, goats are not numerous and usually do not wander far from the native habitations. Fortunately, or unfortunately, there are the lions, which, of course, make short work of a straying goat or kid.

5. In the Atlantic Ocean off Africa

(*i*) *The Canary Islands*

From an interesting and instructive paper written by Mr. Alexander Johnston, in the *African Society's Journal* of 1925, the following is taken:—

Sylviculture and Acclimatization in the Canaries.—Though woods are no longer found growing lower than two thousand feet above sea-level in the Canary Islands, there remain numerous palms and euphorbias indigenous and peculiar to these islands.

Though terribly ruthless in their destruction of peculiar native trees, the Spaniards here have been much less so than the Portuguese in Madeira or the British in St. Helena, where two unique island Forest floras and their accompanying bird and insect life have been wiped out by fire and that justly selected type of sin—the goat.

(*ii*) *St. Helena*

What is undoubtedly the clearest example of the excessive damage caused to Forests by goats is furnished by the sad history of this island's erstwhile tree-covered hills. M. Madon, in his report on the *Replanting of the Island of Cyprus*, describes it in the "Action of Goats":—

The manner in which the destruction of Forests is accomplished by goats is described in Darwin's *Voyage of a Naturalist*, and under "St. Helena" (Introduction, p. 4), and in *Santa Helena* of General Beatson.

The goats were introduced into the island in 1502, and increased there in short time beyond all measure. But as they only destroyed the young trees and respected the old, their ravages were not at first perceived. In 1710 the Forests were still very thick, but in 1724, the old trees having arrived at the term of their existence and having nearly all fallen and those that ought to have replaced them not having sprung up, the Forests disappeared almost suddenly and were replaced by thick grass. The climate disturbance thus caused to the island was very great and mischievous. In 1731 all stray animals were destroyed, but too late, as is always the case.

This sudden disappearance of the Forests was produced after two centuries, and if this destruction was so gradual it is not because this lapse of time was necessary for the multiplication of the goats, for they are referred to as being excessively numerous in 1588, it was the result of their ravages which were suddenly unveiled.

Darwin adds: "Sandy Bay is nowadays so arid (1836) that it was necessary for me to see an official record to believe that trees had ever grown there."

It is the same in the Island of Cyprus. The evil is very great—much greater than one would believe—and it is urgent that a remedy should be applied.

M. Madon, the eminent French Forester, very rightly stresses an important point, which is usually overlooked by most people, even those of education, i.e. the long period of time which elapses before Forest damage is thoroughly apparent so that everyone can notice it. Thus in just over two hundred years the Forests in St. Helena had been completely destroyed—even more so than by felling, as under the latter system some young seedlings grow up to replace trees cut down. With goats there was in St. Helena no possibility of natural regeneration surviving. It is only a very few seedlings, from the millions of seeds which fall to the ground and germinate, that can survive by fortunate chance the endless trampling and omnivorously devouring jaws of the goats.

CHAPTER VII

EXTRACTS CONCERNING GRAZING PROBLEMS IN AMERICA

1. The United States of America

The following is an instructive account of the first Forestry Survey in the State of Illinois, which reveals conditions closely resembling those prevailing in Cyprus (*Report on a Forestry Survey of Illinois*, by Robert B. Miller, Urbana, Illinois, March 1923):—

Grazing.—It is not the custom to graze in the western section of the highlands where the wooded areas are extensive and relatively continuous. Here the clearings are fenced, while the wooded areas are not, probably because it involves too much trouble and expense. Unless opened up by heavy cuttings or repeated burnings, the Forest normally shades out the grasses, so that very little pasturage is afforded. A heavy growth of grass or weeds indicates to the Forester that the stand is not fully stocked. It is unlikely that this rough wooded section will ever be made a field for cattle-raising on a large scale, since the woods do not yield sufficient forage in dry seasons, and if cleared the extremely steep slopes will erode and form gullies. Elsewhere in the highlands the woods generally occupy the slopes or ravines.

These wooded areas are often grazed to supplement the other pastures. Here grazing may cause serious ultimate loss, since the reproduction will be destroyed and the growth of grasses encouraged. The land has been kept in timber because it is too steep to clear, but continued pasturing must result in the disappearance of the timber and the top soil.

The importance of the last sentence cannot be over-emphasized. Illinois has also a comparatively dry and hot climate in the summer. It appears that the grazing

referred to is that of cattle and not goats, though some sheep are usually included. The above account refers to the damage resulting from grazing animals on steep slopes, i.e. the conditions obtaining in the Papho and Troodos Mountains at the present day.

From the south-west a further note is found as to the impossibility of keeping the same species on any area where grazing is allowed. Now the Yellow Pine, mentioned in the following extract, has been introduced into the Cyprus Forests and is growing well. It must have protection from grazing, though, for its growth. Extract by Earl W. Loveridge from the *Journal of Forestry*.

> The great amount of discussion which has taken place in the south-west as to the damage done to reproduction by animals, especially sheep, has been confined almost exclusively to the Yellow-Pine type, which represents a diminishing percentage of the total stand as the Forests farther north are considered. Here, in most localities, Yellow-Pine reproduction is not difficult to establish, and although the sheep danger has been recognized, it is no longer the major management problem.

Again it is a strange coincidence that goats are not mentioned, but in this case, as elsewhere, the damage of sheep is mentioned, as there are no goats in the locality.

A further instructive account of grazing is given below of some areas exactly like the Cyprus Juniper regions, that is to say, those in Colorado and part of the State of Utah (*Journal of Forestry*—American Foresters—"Should the Pinon-Juniper Lands be Included in the National Forests?" by D. S. Jeffers):—

> *Present Use.*—There are three distinct uses made of these lands, each making a definite contribution to the community. The chief present use, because it is shared by more people, is that of grazing.

Second in importance is the use of the Forest cover for fence posts. Good post material is becoming scarce. By insuring a perpetual supply of pinon and juniper on the National Forest, a distinct contribution is made to the agricultural settlement, development, and improvement of the adjacent territory. This is accomplished through the growing of valuable fence posts, telephone stubs, and fuel wood.

The following plan for handling the Pinon-Juniper type of Forest, by A. F. Hoffman, is instructive:—

Prohibiting all summer grazing, but allowing spring and fall grazing of cattle and horses, also sheep and goats, after ten years subsequent to any cutting.

Prohibiting all grazing by sheep and goats for ten years after each cutting:

1. A sustained yield of Cedar post and pole material and Pinon fuel will be made available for the region tributary to the type.

2. The much-needed protection afforded to the farming lands by a timber cover will be insured.

For Cyprus the chief interest lies in the stressing of no grazing in the summer months and none for ten years after any cutting has taken place in the case of sheep and goats. Considering that Cyprus Forests are gradually being cut over in accordance with definite sylvicultural system and in consonance with sustained yield, grazing is thus ruled out entirely.

The following results of experiments with grazing and burning areas and then feeding off horses, cattle, and hogs, but no sheep and goats, shows clearly the damage done, which would have been very much worse with the latter-named animals (*Journal of Forestry*, Official Organ of the Society of American Foresters, "Roberts' Plots"):—

The Roberts' plots of four quarter-acre areas, established in typical cut-over long-leaf Pine land, were treated as follows:—

One burned and grazed over by horses, cattle, and hogs;

One unburned and grazed over by horses, cattle, and hogs;

One burned annually in the winter and ungrazed; and
One unburned and ungrazed.

The plots were established the second winter after the heavy periodic seed-year of 1913, and were covered with long-leaf seedlings from that seed crop. They had not been burned over since the seed fall. The annual fires, which began on the burned plots in 1915, were set in every case during a damp day in winter, when vegetative activity is least.

For the first five years the results were that in the grazed areas everything was destroyed by razor-back hogs, except one or two advance-growth short-leaf Pines. In the burned area, protected from grazing, fires had not an effect on the long-leaf seedlings in the first five years, beyond retarding the height growth. By contrast, what few short-leaf and Loblolly Pines there were succumbed to these early fires. The unburned, ungrazed area suffered no perceptible loss from any cause, and exhibited a greater rate of growth than where fires occurred, and also a few short-leaf and Loblolly Pines came in. This greater number of seedlings per acre was in spite of the fact that there were two or three large trees on this protected plot, which reduced the number of seedlings under them through shading, or root competition, or both.

It is hoped that the above-mentioned experiments in the United States, undertaken in the Pitch-Pine area, i.e. in the dry south-eastern part of the country, will convince any Cypriot shepherd that grazing does harm to natural regeneration, despite their view to the contrary.

A great controversy has recently raged in the United States regarding the grazing of animals in the National Forests and on the public lands. From *American Forests and Forest Life*, September 1925, "Shall the Stockmen Control the National Forests?" by Ovid M. Butler:—

The Issue of the Range.—Drives have repeatedly been made upon the National Forests. Now come the western stockmen fighting for the forage on Uncle Sam's mountain ranges.

Incensed over the proposal of the Forest Service to place what it considers a fair market price on the forage on 90,000,000 acres

in the National Forests, they are organizing a great offensive to carry through Congress a special Act which will

1. Reduce the grazing fees on the National Forests to rates equivalent to the Government's cost of administration. This would mean $3,000,000 from the annual revenue of the National Forests.

2. Give legal status to grazing in the National Forests.

And back of these demands, conservationists see a more menacing purpose—the acquirement by the stockmen of a property right to grazing lands in the National Forests.

This difference may be illustrated by applying the two views to the stock grazed upon the National Forest in 1924. In that year the 30,978 grazing permittees paid $1,012,015 for grazing 1,722,271 cattle, and 6,330,376 sheep, and 100,000 goats on an area of 90,000,000 acres out of a total reserved Forest area of 136,000,000.

It is of interest to point out here that, in comparison with Cyprus, huge areas are involved. Grazing is allowed on 90,000,000 out of 136,000,000 acres. The figures show that one goat grazes on 900 acres, and that 36 donums are allowed to each sheep. Thus the damage is by no means as great as it is in Cyprus, where climatic conditions are not so favourable for tree-growth. If such a large area per animal were available, there would be no necessity for the Forest Department to make strenuous efforts to reduce the number of animals allowed to graze.

Another extract on the same question reads:—

We must recognize the fact that, whatever we may say about it, the forage on the National Forests is a commercial commodity. It is exactly like any other forage. Forage is one of the great commercial commodities of the Western States, and its character in that respect is not changed by property lines. A range is bought, sold, and rented every day. It has its market and its prices. It is just as much a commercial commodity of the West as are the live stock products derived from it, or the standing timber on the National Forests. It is only fair to point out that the users of the National Forest ranges have for many years commercialized their forage business.

Within the National Forests in the United States there are 90,000,000 acres on which the grazing of live-stock is allowed under permits. Why, it is asked, should the Government with one hand single out the Western stockmen as beneficiaries by giving them forage worth millions of dollars at merely the cost of the giving, and with the other hand hold the lumbermen to full commercial value of the timber? Furthermore, declare the conservationists, the principles underlying the stockmen's claims, if applied to the other resources of the National Forests, would speedily dismember the Administration of one of the greatest natural resources owned by the American public.

General Attitude of Grazing in the Forests.—From the following it can be noted that Foresters the world over are quite impartial in their conclusions as to grazing (*Journal of Forestry*, 1924—American Foresters —"To what Extent should Grazing be a Factor in Forest Management Plans," by John Halton):—

Working plans for every Forest are necessary and include all forms of management to which a Forest can be put. Such plans are made for a period of at least ten years, but envisage the whole length of the rotation as far as the species of trees is concerned.

The prominence the grazing subject should have in any particular management plan would depend, I should say, upon the particular conditions of the Forest to which the plan is applied. In other words, whether grazing is a positive or negative factor.

The type of Forest, the topography, the absence or presence at certain times of timber, tree-planting projects, erosion possibilities, etc., would be points to consider, as having particular bearing on grazing uses. But each management plan, it seems to me, should have these essential subjects, which have such an intimate bearing on sylviculture practice and watershed protection generally, definitely incorporated in the plan even though they might be disposed of in some instances by a "Yes" or "No" answer.

In our grazing studies and in our grazing inspection outlines the effect of grazing on other resources, particularly the Forest, are always made prominent. The grazing reconnaissance outline, all through the various parts, brings out these points especially, and provides appropriate comments in all unit descriptions.

Reproduction—character of, and extent of injury, and species and height of trees injured. This question of injury to reproduction is

very important, and data relating to it must be noted for each timber type in the description.

Then under the preparation of the management plan we have "General correlation of grazing and other uses of the Forest" with special reference to the timber resources. An instructive account is given of the varying factors and conditions under which grazing may be practised in the United States in the *Journal of Forestry*, "Range and Pasture Management," by Arthur W. Sampson, M.A., Ph.D., University of California:—

This volume is unquestionably more than welcome to a host of interests, among which naturally belong the student of range management, the stockman, Forest Service Official, and, in fact, anyone connected with the growing of live stock and particularly sheep and cattle on Western range and pasture lands.

The preface gives the book a threefold purpose, namely:—

. . . . . .

To aid those who are interested in the solution of certain problems in range management.

. . . . . .

There are four parts:—

Part I takes up the grazing industry and range control. Two very interesting chapters deal with our methods of grazing control in the United States, and the several classes of grazing land, such as Natural Forests, State, and private lands. The first chapter describes in a striking manner the cause and effect of over-grazing, and ends with a touch of romance on range wars.

Part III takes up range and pasture protection. It embodies a discussion of four of the principal agencies through which range and pasture lands are rendered less productive and offers practical protective measures relating to them. Throughout this part one finds that over-grazing is a big influencing factor.

In the chapter on "Control of Erosion on Range and Pasture," the author, who is an "erosion expert," shows in an authoritative manner just what erosion is, its influencing factors, and the power

it exerts on vegetative cover. The average reader will find that he little realizes the intimate relation of erosion to plant growth and revegetation, which is brought out very clearly. Aside from the fact that we all know erosion is a destroyer, one of the many points emphasized, which is probably not generally appreciated, is the inability of eroded soils, due to their decrease in fertility and capacity for holding the moisture, to produce anything like what non-eroded soils are capable of doing. The keynote of the entire chapter is struck when one reads:—

> "Remove the upper dark layer of humus soil and you have taken the productive part—the part you pay for when you buy the farm."

"The Solution of the Erosion Problem" is found at the end of the chapter summed up in five points, under the heading "How More than Half of the Erosion Battle is Won." Here we find again that successful range and pasture management depends primarily upon the proper control of stock.

Those particularly interested in the use of the National Forests for grazing purposes will find good reading in the chapter on "Grazing and its Relation to the Future Timber Supply." Since the National Forests have been created chiefly for the purpose of growing timber, and the interests of many stockmen are centred in their use as range lands, it is of interest to know that grazing, although recognized as a limiting factor to timber production, can be regulated so that the conservation and furtherance of our timber resources will not be impaired. It is interesting to note that very logically the author's conclusion, as well as many others which are the result of exhaustive investigation in this phase of the work, have resulted in a system of regional application with respect to timber reproduction. So we find that in order to produce a satisfactory stand of reproduction, it is not advisable, in some regions, to graze sheep and goats, while the grazing of cattle and horses under the same conditions is safe. Again it is pointed out that where artificial planting is necessary, exclusion of all classes of stock is paramount until reproduction is established. The chapter on "Burning of Pasture Lands and its Effects on Forage Production" should reap, as a just reward, a long line of supporters, some of whom have possibly laboured under what the writer terms "a common delusion."

After giving in a very vivid way his story of present-day burning, the author points out the why and wherefore of this practice, an

analysis of which clearly shows that it does not take into consideration future productivity.

Of the many salient facts brought out in the discussion of the "Effects of Burning on Forage Production," either on grass lands, bush lands, or wooded pastures and Forest ranges, are:—

That the soil is robbed of the plant food elements essential to vegetative growth.

That the better and highly priced perennial forage plants are destroyed and replaced by inferior and unpalatable vegetation.

That old growth serves both as a feed and protection to the young growth.

Finally, that burning courts erosion.

With respect to grazing capacity we find that due to variable and uncontrollable factors the grazing capacity factor is very difficult to determine. The method now generally accepted and used by the Forest Service, in which the grazing capacity is based on reliable reconnaissance figures together with forage acre requirements of stock, eliminates this difficulty to a great extent and renders much-needed data available in good form that would not otherwise be obtainable. Rangemen should be particularly interested in the acreage required to maintain certain classes of stock yearling under different conditions.

Cypriots in reading this might do well to note that the United States covers over three million square miles, and thus the conditions in many parts are very cold and moist compared to Cyprus, with the result that grazing may be less harmful or do no damage at all, whereas in the small area of Cyprus, under its dry climatic conditions, grazing is absolutely harmful to the Forests and should not be tolerated.

The following extract from *North American Forests and Forestry*, by Ernest Brunken, gives in a concise manner the pith of the grazing question:—

Another factor in the struggle for life of the American Forests has hardly yet been mentioned, that is, the injury done by the pasturing of domestic animals. This source of injury is neither so widespread nor so picturesque as the damage done by fire. Yet in some localities it is an equally great obstacle to profitable Forest cultivation.

But in the mountain Forests of the Rockies and the Pacific Coast, where immense herds of cattle and sheep are pastured, the injury done to the small trees by the biting off of young shoots, the tearing down of branches, and the trampling down of seedlings is enormous. In the great Forest Reserves recently set apart in that section by the Federal Government, the herding of animals is now permitted only under strict rules designed to reduce the damage to a minimum, to the great disgust, however, of the cattle-owners, who, like other people, can see but their own interests, and cannot be convinced that other people, especially the nation as a whole, have rights in the matter. In the Alleghany region, especially those portions which are thinly settled by a poor and ignorant class of farmers, but where agricultural development is not likely to continue, much damage is done by cattle, which destroy seedlings and tree-roots.

Comment on the above should be unnecessary, as it expresses in the simplest language what every Forester and well-informed inhabitant of most countries know to be true. It will be a glad day when the majority of the Cypriot shepherds acknowledge it also.

In *American Forests and Forest Life* of February 1926, the following was published:—

The Forester or the Shepherd.—The people of the United States may well turn to the experience of some of the older countries for advice on the question now confronting them.

To what extent and under what conditions shall grazing be permitted on the 700,000 square miles of public lands in the West? What happens to Forest lands when the shepherd becomes legally entrenched through prescriptive rights and beyond regulation is clearly written in the treeless countries surrounding the Mediterranean Sea, the poverty and desolation of Spain.

The author of the above, Mr. P. L. Buttrick, has travelled extensively abroad and has gone deeply into the history of grazing in European countries.

The Grazing Menace on our National Forests, by H. H. Chapman:—

The National Forests were set aside from our public domain as a protest against Forest destruction and as a measure for conserving

and restoring, at least in part, the once abundant Forests of America. This basic purpose is now threatened by the tremendous growth of the grazing industry within these Forests, and their demands that the privileges which they have secured by administrative leniency be recognized as legal rights and thus fastened upon the National Forests for ever.

The founders of our National Forest system did not fear regulated lumbering, but they had abundant evidence on the ravages of fires upon the Forest.

But what about grazing? On May 1, 1897, a committee which had been appointed by the National Academy of Sciences at the request of the Secretary of the Interior, Hoke Smith, to investigate and report upon the inauguration of a National Forest Policy for the Forested lands of the United States, and composed of

Professor Charles S. Sargent, of the Arnold Arboretum, author of the standard work on American trees;

Professor William Brewer, of Yale, a pioneer in agricultural experiment station investigations;

Gifford Pinchot, afterwards Forester of the United States, and four others,

made this statement:—

"Nomadic sheep husbandry has already seriously damaged the mountain Forests in those States and territories where it has been largely practised. In California and Western Oregon great bands of sheep are driven in spring into the high Sierras and Cascade ranges. Feeding as they travel from the valleys at the foot of the mountains to the upper Alpine meadows, they carry desolation with them.

"Every blade of grass, the tender growing shoots of shrubs, and seedling trees are eaten to the ground. The feet of these hoofed locusts, crossing and recrossing the faces of steep slopes, tread out the plants sheep do not relish, and, loosening the Forest floor, produce conditions favourable to floods. Their destruction of the undergrowth of the Forest and of the sod of the Alpine meadows hastens the melting of snow in spring and quickens evaporation. The pasturage of sheep in mountain Forests thus increases the floods of early summer, which carry away rapidly the water that under natural conditions would not reach the rivers, where it is most needed for irrigation, until late in the season, and by destroying the seedling trees on which the permanency of Forests depend, prevents natural reproduction, therefore ultimately destroys the Forests themselves."

Continuing the report states:—

The Government, in permitting free pasturage of sheep on the public domain to sheep-owners in the public lands, clearly commits an injustice to persons engaged in this industry in other parts of the country. The pasturage of sheep on the National domain has been so long allowed, however, that the men who benefit by it have come to believe that they have acquired vested rights in the public Forests, and their trespass can only by checked by the employment of vigorous measures.

Finally, this committee states:—

It must not be forgotten that the public domain, of which these reserves form a part, belongs to the people of the whole country and not to those of any one section—a few sheep-owners should not be allowed to exterminate great Forests at the expense of the country.

Consequent upon this report, the Act of June 1, 1897, while opening up the National Forests to lumbering, mining, hunting, water-power, and recreation, made no provision whatever for their use for grazing. The object of the National Forests, as stated in this Law, is clearly indicated:—

No public Forest Reservation shall be established except to improve and protect the Forest within the Reservation, or for the purpose of securing favourable conditions of water-flows, and to furnish a continuous supply of timber for the use and necessities of citizens of the United States.

It is evident that when the National Forests were created, the production of live stock was not considered one of the objects of their establishment, but, instead, was regarded as inimical to the very purposes which they were to serve. Stock-grazing was prohibited by Order of the Secretary of the Interior, and sheep were rejected from Forests.

But they came back. Under enormous pressure—

economic, scientific, administrative, and political—the sheepmen recaptured their old ranges.

The writer's own observations on this point covered practically every National Forest in the States of Arizona and New Mexico, or a total of 21,000,000 acres, nearly one-fourth of the 88,000,000 acres which are subject to grazing privileges in the National Forests, and extended over a period of two years in 1917–18. Without exception, grazing damage was observed wherever sheep used to range, and in some instances the differences between the absolutely denuded sheep ranges and adjoining fenced pastures or ranges used only by cattle were startling and conclusive. The worst of this damage occurs when the seedlings are small. The sheep bite off and bodily consume many one-year seedlings, and defoliate those of somewhat larger growth. The damage continues until the leader or main shoot attains a height of about three feet, out of reach of the sheep.

Sheep-grazing is largely responsible for the failure to secure satisfactory reproduction on 200,000 acres of Western Yellow Pine cut-over areas on the Coconino and Tusayan National Forests in Arizona.

These areas comprise nearly all the cut-over lands on these Forests. A continuation of such sheep-grazing on other lands as they are cut over could eventually reduce these Forests to a prairie covered with coarse, unpalatable, and inflammable bunch grass. Information on this damage was published in 1904 by J. B. Leiberg, in 1909 by G. A. Pearson, in 1917 by R. R. Hill, and the whole question was summed up in final form by Mr. Pearson in 1923 in *Bulletin* 1105 of the United States Department of Agriculture. Yet, over this entire period the grazing damage continued with increasing

severity, and attempts to reduce or properly control it were for the most part side-tracked or postponed by demands for further investigations, rehearings, or appeals. At the present date a reduction of 30 per cent. in the number of sheep—admittedly necessary even for the protection of the range itself—has been postponed until it can be shown by segregation how much of this damage is due to sheep and how much to cattle.

In the year 1924 there were grazed within the National Forests 6,301,308 sheep and 29,068 goats, belonging to 5,694 owners; while 1,664,087 cattle found pasturage in these Forests, representing 25,286 owners. This represents 30 per cent. of the live stock in the Western States. These permits for grazing are rapidly being put on a ten-year basis, which will make reductions exceedingly difficult. The entire system has been built up by administrative permission. Since the Law did not specifically forbid it, grazing could be allowed, provided it did not thwart or jeopardize the fundamental objects of the Forest Reservations. The Secretary's control was absolute and his right to regulate, reduce, or prohibit all grazing was twice upheld by the United States Supreme Court.

If sheep- and cattle-grazing can be permitted, under regulation, without endangering the Forests, the nation is the gainer. But can they, and to what extent? Evidence goes to show that in spite of the intent of the Forest Service to prevent grazing, this damage has occurred over widespread areas to an alarming extent. Just how much damage has been done and how widely disseminated it is not possible to say. But one thing is certain—sheep have not changed their habits since their destructive tendencies first led to the recommendation for their total exclusion from these Forests

in 1897. The damage may, it is true, be reduced in proportion to the lessening of the number of sheep permitted on the range; but the important fact is that sheep will eat young pine seedlings more readily than they will the coarse bunch grass which in Arizona and New Mexico especially is the characteristic vegetation in the Western Yellow-Pine type.

Owing to this fact, which has been proved beyond dispute by nearly twenty years of study at the South-Western Forest Experimental Station at Flagstaff, Arizona, it is probably impossible to graze sheep on such Yellow-Pine ranges without doing some damage to pine seedlings. At any rate, if it is possible so to control grazing that damage can be averted, then grazing has not been properly controlled. In fact, serious over-grazing has occurred on these National Forests, so much so that the forage itself or range has been severely depleted and valuable forage plants have been destroyed.

Grazing damage differs in severity with many factors, but comes down finally to this: Is there forage enough of kinds other than tree seedlings, which sheep will prefer to Forest reproduction, to feed all the sheep placed on the Forest areas during the periods they are grazed and every year they continue? It is claimed, and it may be true, that in some of the Forests forage conditions meet this requirement. But it is easily proved that such conditions will not continue for over a year if the control of grazing is taken out of the hands of the Forest Service. Witness the conditions in the Thunder Mountain region of Idaho while under free and unregulated grazing.

In *American Forestry*, March 1919, page 907, Henry S. Graves writes:—

More serious, however, is the injury to the ground surface by the excessive and utterly unregulated grazing of sheep.

Not only is over-grazing destroying the better grasses, but the soil is being rapidly washed away. Gullies are being cut that already are from one to two feet deep, and with every flood are being scoured out to a greater width and depth. Portions of the area are described by Forest Officers as practically a dust-heap.

Due to these disastrous effects of over-grazing, the Thunder Mountain area was placed by Congressional Enactment in the National Forests in order that this grazing damage might be stopped by rigid regulation of the industry. Frightened by the prospects of having in the near future to pay for the Forest forage at its true value instead of at low or nominal rates, stockmen have seized upon what they regarded as an opportunity to appeal to public or Congressional sympathy to secure and conciliate their hold on the National Forest ranges for ever, by seeking legislation which will deprive the Secretary of Agriculture of his control and protection of the National Forests against grazing damage. Such damage would, under these proposals, require the proving of wilful intent in a court of law before it could be abated. With two-thirds of the entire area of the National Forests, exclusive of Alaska, already burdened with grazing privileges which have proved very difficult to control even with the present absolute authority of the Secretary, and with inaccessibility to stock as the main reason on the remaining one-third for deterring the extension of grazing over the entire area, it is time that the public were appraised of this situation and informed against accepting any legislation which will rank grazing as a primary objective of our National Forests; much less to permit the grazing interest to control these vast areas by hardening their present privileges into legal rights, rather than relinquish one jot or tittle of the present control: this should be immensely strengthened until damage from over-grazing ceases to exist, no matter what reductions or exclusions may be necessary to accomplish this purpose.

The unreserved public lands comprise 184,726,846 acres. They are under the administration of the Department of the Interior. According to the present Secretary of the Interior, Humbert Work, this vast area is

> "now being utilized for grazing under sufferance without charge or control by the Federal Government. This gratuitous use of the public domain as an unrestricted range for live stock

has resulted in over-grazing. Wide areas have been almost denuded of native grasses."

Grazing has never been administered or regulated on the public domain as it has been during the past twenty years on the National Forests. Consequently the value of this range has steadily diminished as a result of abuse and over-grazing. The range within the National Forests, however, because of the regulation which has been exercised by the Forest Service, has become more valuable and more sought after. Recognizing the destruction which follows unregulated grazing on public lands, Secretary Work, in his annual report, is recommending legislation to preserve the remaining domain from ultimate destruction by the grazing industries. It is urgent that this legislation be passed at once, but the failure of one arm of the Government sooner to regulate grazing lands must not be the indirect means of subverting the policy for conserving our timber supply on those publicly owned lands pre-eminently suited for timber production.

Another interesting experiment as to the effect of grazing on erosion has been in the State of Utah, and the following is an abridged account of it (*Journal of Forestry*, by Louis S. Murphy, "The Erosion Problem," by C. G. Bales):—

In the effects of grazing we have a case almost parallel to the effects of road-building. Anyone who has observed will admit that a cow trail parallel to a stream or cutting down its steep banks is very likely to start erosion which may result in a deep gully. The experiment carried on in Utah has shown that over-grazing of a mainly grassy watershed greatly increases the silt removal. The prevention of erosion should be considered quite as carefully as the carrying-capacity of the range, in every phase of range management.

At the present time grazing in the Tonto Forest is being reduced 50 per cent. in order to check the erosion which is silting up the Roosevelt Reservoir at the rate of 18,000 cubic yards annually (or perhaps much more).

As this side of the grazing problem has received too little attention in Cyprus by the people generally, it is as well to give an example of the damage done in a country with similar climatic conditions to Cyprus.

2. Canada

From the annual report of the Director of Forestry of the Dominion of Canada it is seen how small a place the grazing in the Forests takes in their general economy. To Cypriots this is all the more significant, inasmuch as the climate produces grasses of all kinds, which remain succulent for several months of the year. From the 1922 report the following is taken:—

The total number of live stock grazed was 88,392, a decrease of about 2,000 head from the preceding year. This number was made up of 58,938 cattle, 18,502 horses, and 10,952 sheep.

From that of 1923 the following:—

Grazing.—Permits issued during the summer season amounted to 586, approximately the same number as in 1921, covering 26,062 cattle, 8,106 horses, and 1,197 sheep. Winter-grazing permits were issued for 1,790 cattle and 2,600 horses. Grazing during the winter is not encouraged.

From that of 1924 the following is taken, being the "Report of the Director of Canada for the year ended March 31, 1924," by E. H. Finlayson:—

A continued decline in grazing on the Forest Reserves is reported from all prairie districts. The decline was in part attributed to the good supply of feed on private lands.

During the year 706 permits were issued representing 26,223 head of stock.

Grazing.—A grazing-permit policy for the Forest Reserves in British Columbia was inaugurated during 1923. Grazing regulations were put into effect generally for all Forest reserved areas, but an attempt was made to bring before the ranching public the benefits and advantages of regulated grazing under the Forest Reserves Grazing Regulation.

Permits issued during the summer season amounted to 20, covering 726 head of cattle, 50 horses, and 942 sheep.

It appeared to me desirable to give quotations from several reports to show that though the areas are large,

yet very few animals are grazed there, but also that goats do not appear anywhere in the Forests. If goats were such harmless animals to the Forests as the Cypriot goatherd always asserts, surely in the freest of Forest countries, Canada, they would be found grazing in the Forests, but happily this is not the case. There are 11,000 which are kept in proper goat-sheds and on small areas of fields and pastures under a proper intensive system of agriculture in British Columbia. The milk yield is 2,000–3,000 lb. each.

From the *Illustrated Canadian Forestry Magazine* the following is taken:—

> Dominion Forest Reserves are the People's Forests.
>
> The National Forests protect stream-flow and provide timber, fuel, hay, pasturage, and recreation for the prairie residents.—JAMES LOWLER, Dominion Forestry Branch.
>
> Every acre of land put to its best use. Grazing 100,000 head of stock.
>
> On these areas there are now pastured about 100,000 head of stock annually, composed of cattle, horses, and sheep. The grazing is regulated so as to permit each area to be grazed up to its full capacity without endangering the pasture.

CHAPTER VIII

GOAT-GRAZING IN CYPRUS FROM 1878 TO THE PRESENT

WHEN the British Government first occupied Cyprus the Forests were in a poor condition: 237,000 sheep and 210,000 goats were in existence in the Island, causing devastating damage. For centuries the Forests had been subjected to abuse, and, in consequence, they were fast disappearing. The devastating fires, the wasteful and irrational felling, and the extravagant methods adopted for procuring resin had reduced them to sparsely stocked areas of shrub, with the exception of those which existed in the almost inaccessible mountainous areas. The lower and middle zones had been practically depleted of their wealth, supporting dwarfed scrub almost worthless for the production of timber instead of high Forest. The naturally regenerated seedlings, which in normal circumstances germinate from the seed liberated by the falling cones and form a thick undergrowth until they ultimately grow up and replace their parents, were steadily eaten down by goats. The water-conserving properties of the soil had vanished with the decomposition and destruction of the organic humus.

The first important measure taken in Cyprus for the conservation of the Forests was the passing of the Forest Law of 1879. The destructive habits of the people were partially checked, and the remnants of the Forests were saved from destruction by the introduc-

tion of this legislation. This Law empowered the High Commissioner, by a notification in the *Cyprus Gazette*, to declare the whole, or any part of Forest land, excluding that belonging to private individuals, to be under the protection, control, and management of the Government. It provided for the punishing of offenders who felled and removed trees, collected Forest produce, or pastured cattle without permission. It laid the foundation of control whilst giving, at the same time, due consideration to the requirements of the people.

The progress attained by the passing of this Law was considerable. The Government was enabled to regulate grazing in all areas according to the yield of the Forests.

In 1881 another Law was passed which made provision for the determination of the limits of Forests under the protection, control, and management of the Government. It defined the term "Forest land," and declared that from then onwards all such lands were to be State Forests. It described also the procedure to be adopted by persons objecting to the delimitation because of alleged rights.

Unfortunately for years there was no appreciable reduction in the number of animals allowed to graze in the Forests, and steps were taken therefore to prevent the undue increase in the number of goats by the introduction of another Law. This Law prohibited the importation of goats into Cyprus, with the exception of those specially authorized by the High Commissioner in Council for the Courban Bairam or other purposes, and stipulated that the tax payable annually on goats and sheep could be increased.

Following this period agriculture appeared to advance steadily. More attention was paid to the cultiva-

tion of the land. Gradually the low-lying villages of the Messaoria adopted better principles and abandoned grazing for agriculture. Subsequently villages in the intermediate zone followed their example and came to realize that goat-grazing and farming were incompatible. A tendency to dispose of goats and substitute sheep became manifest. During this period large numbers of goats and sheep were annually permitted to graze in the Forests, despite the fact that they caused considerable damage.

The Forests were not sufficiently protected, although in a better state of preservation than formerly. Their condition necessitated recourse to other measures. In certain inaccessible areas they recovered at a remarkable rate, thereby proving that Nature, if given opportunity, would efface the visible signs of abuse in time.

The position in many of the villages in which improved methods of agriculture were being adopted was curious. A division of opinion became manifest, as it was perceived by some that the goats kept by the shepherds were retarding advancement.

In the year 1913 the Goat Law was passed. Up to that year the Forest Department had endeavoured to carry out the prescriptions of the Laws. Attempts were made to determine the maximum number of animals which could be allowed to graze, and to ameliorate the conditions under which the inhabitants of Forest villages were living.

The following is a brief description of the meaning of the Goat Law:—

In 1913 this far-reaching local-option Law with regard to the keeping of goats was enacted. The aim is to enable any village, by vote of the property owners, including those possessing over twenty-five sheep or

goats, to exclude goats from being kept within the village boundaries. During the last thirteen years, out of a total of 641 villages, 140 have balloted against the keeping of goats within the village lands.

Generally there is a great improvement in the villages where the goats have been excluded, especially in the matter of growing fruit-trees of all kinds.

If some of the inhabitants of a village wish to exclude goats from being pastured on the lands included within the boundaries of it, a petition signed by not less than ten property-owners is addressed to the Commissioner of the District. Provided that the latter is satisfied that this represents the genuine wish of a number of the inhabitants, it is arranged to hold a ballot, when everyone of proper age eligible is supposed to vote.

After the ballot is taken and the votes counted, it is ascertained whether the villagers are in favour or against the keeping of the goats; if of the latter way of thinking, then within fifteen days all goats have to be removed from the village. There is a clause in the Law stipulating that if there are any left after the determined date, the Government will purchase such goats at the prevailing market price. During the whole period of the operation of the Law, there has been no case in which the Government was obliged to buy any goats. It is true that the goats from such a village are sold to others, who live in a village where goats are allowed to be kept. Also, unfortunately, some owners of goats in a proscribed village immediately arrange to keep their goats in a neighbouring one which is not proscribed.

Goats for immediate slaughter are allowed to be brought into a proscribed village for that purpose only, and no other goats are allowed to be kept.

Large farms, known as *chifliks*, Tekes, Moslem

religious foundations, or institutions owning buildings and lands, and monasteries over 500 donums in extent are exempt from the operation of the Law, although their land may lie within the boundaries of a goat-proscribed village. On the whole this exception to the general rule has stereotyped the keeping of goats by these institutions, and not voluntarily have the authorities in charge of such places taken any steps to improve their methods of keeping goats. These arborivorous animals can still be seen devouring the scanty growth of tree seedlings in the Forest or eking out a mere existence on a sun-parched area of village land, much to the annoyance of the more enlightened inhabitants, who always feel that they are not getting the full benefit of the Law.

The most startling example of this process is seen near the village of Phini, in the vicinity of which is situated the monastery of Trooditissa. Whilst the villagers have balloted against the keeping of goats in or outside the Forest, the monastery is still allowed to pasture 100 goats on an area of 1,000 donums (333$\frac{1}{3}$ acres) of the Troodos Forest. The villagers naturally feel aggrieved, as this provision of the Law, which does not apply to the monastery, reacts to their disadvantage. They used to graze goats in the Forest too.

Generally, from every point of view, there is no doubt a great improvement in the economic and agricultural or horticultural position of a village which has ceased to keep goats roaming within the village lands.

Unfortunately, no accurate figures are available to show exactly to what extent there is an economic improvement, as no data have been kept either in the villages themselves or elsewhere. The most enlightened say that the fruit-trees have borne far better, more

trees have been planted, and agriculture generally has advanced.

In the most highly developed villages the Goat Law has had the effect of hastening the process of improvement in the keeping of animals, including goats. In the village of Lysso, for instance, there is a locally bred goat which gives two quarts of milk a day. It was an ordinary animal of local birth and breed which had been carefully tethered, and to a slight extent stabled, as well as hand-fed. The owner is very well satisfied with the results of his labour, and considers it well worth the trouble, and any extra expense has been reimbursed from the sale of the larger amount of milk and cheese.

From time to time there have been various suggestions as to the amendment of the Law in the direction of allowing, say, up to four goats per family of any village which had balloted against the goats. At first sight this appears a most reasonable proposition, and would be in most countries; however, from an experiment which was tried in some of the Paphos villages a few years ago, it would lead to the reintroduction of the goats on the same scale eventually as they were before the introduction of the Goat Law in Cyprus.

Despite this bad experience, in the interests of the improvement of the economic position of the Island, no stone should be left unturned in order to try and teach the people to keep goats and other browsers under a proper modern system of animal husbandry.

It would have been thought that after nearly fifty years of Forest management in the Island that many persons would have appreciated the fact that every effort was being taken by the Forest Department to improve the Forests and by the Agricultural Department to improve the live stock.

It appears, however, that any proscriptions or other laws framed for the purpose of improving the conditions are not as powerful as economic laws, such as that of supply and demand.

Apart from any amendment in the Goat Law, which may be feasible with the intervention of the cataclysmal years 1914 to 1918, the Forest Department was fully employed in cutting and transporting timber and fuel for exportation. The grazing question became, for the moment, of secondary importance, and unavoidably was given less attention than it deserved.

The demand arose for enormous quantities of timber and fuel, which at that time could only be procured with difficulty elsewhere. The countries—with the exception of Russia, which was inaccessible—from which the Mediterranean markets were habitually supplied were in enemy hands, and there was no alternative to meeting the demands from the resources of Cyprus.

The Forest Staff, although strengthened, could scarcely cut, transport, and ship the supplies rapidly enough. Every effort was concentrated on this branch of the work, and temporarily the grazing problem had to be set aside.

Matters remained quiescent until the termination of the war, and then came a vigorous reaction. It was discovered that the shepherds were grazing their animals where they pleased, and that they had begun to get accustomed to large areas and the laxity of control. The Forest Staff, on returning to their normal duties, were faced with the prospect of having to reafforest on a scale larger than that contemplated. The shepherds, shirking all thought of the possibility of a timber famine in the future, or diminished rainfall, upheld

their claims for increased grazing facilities. The Forest Staff tried persistently, by demonstrations, lectures, and debates, to drive home the need for exercising better control of grazing. The opposition put forward absurd arguments, such as "Goats cause no damage to Pines," etc.

Simultaneously in all districts, applications for grazing permits were sent in, and, when legitimately refused, they were followed by protests and threats. Demands for timber, ploughwood, charcoal permits, chairwood, many other kinds of Forest produce, and for the concession of encroachments were made at the same time, and lastly a sequence of devastating Forest fires occurred.

From the return of animals counted for tax, as well as showing the number allowed to graze in the Forests, it will be seen that at the present time a larger proportion of animals are grazing in the Forest than ever before, except in the year 1924.

It must be pointed out that this is a serious position for a country to tolerate for any length of time. In the year 1923 the position was the best in the history of the Island, only 4 per cent. of the goats being allowed to graze in the Forests. Ten per cent. of the sheep being allowed to graze is also very serious for the welfare of the Forests. It is true most of the damage is done to the less valuable Forests in the Karpass, nevertheless, the Forests there are also very necessary for that part of the country.

As it is always assumed that the grazing permits are issued to poor shepherds and that they have no other means of living, it must be put on record that many of the permit-holders are men of substance and own many properties or houses. In fact, from observations made

it is rare to find a shepherd in debt. He lives at the public expense by grazing his animals in the Forest, and so does not need any temporary financial accommodation, which the farmer may stand in need of at various times of the year in specially bad seasons.

This is a distinct factor which militates against the change of method on the part of the shepherd. He very rarely has a bad season, when many animals die. He either presents other villagers with cheese or other goat produce in return for being left alone to do as he likes, or otherwise he threatens anyone who objects to his animals grazing in their properties. Under the Rural Constables Law of 1923 the position in this respect has improved and is improving every year.

In the past it was assumed that the goatherds only raised goats for their own use. Nowadays this is quite a rare exception. The majority of the goatherds keep these animals simply as a business proposition. During the year kids of one year old or older are sold, besides cheese, and skins, if they kill any goats themselves. Also from the goats' beards ladanum is collected and sold at the rate of 8s. per oke. Goatherds have stated that they require 2s. 6d. per day to make up for the lucrative business of keeping goats grazing at the public expense. It does not appear that their estimate is too high when the free open-air life is taken into consideration.

NUMBER OF ANIMALS COUNTED AND THOSE ALLOWED TO GRAZE, 1894 TO 1927

Year.	Animals.	Counted for Tax, etc.	Allowed to Graze.	Percentage.
1894	Goats..	226,451	38,565	17
	Sheep	245,834	24,113	10
	Other animals ..	146,901	6,040	4
	Totals	619,186	68,718	11
1895	Goats..	221,883	37,879	17
	Sheep	252,904	21,170	9
	Other animals ..	148,825	4,515	3
	Totals	623,612	63,564	10
1896	Goats..	251,819	46,042	18
	Sheep	272,122	22,150	8
	Other animals ..	157,738	7,207	5
	Totals	681,679	75,399	11
1897	Goats..	263,750	44,770	17
	Sheep	294,374	21,217	7
	Other animals ..	149,807	4,405	3
	Totals	707,931	70,392	10
1898	Goats..	270,841	25,362	9
	Sheep	290,888	5,474	2
	Other animals ..	140,263	3,210	2
	Totals	701,992	34,046	5
1899	Goats..	253,572	24,121	10
	Sheep	277,828	3,625	1
	Other animals ..	135,219	3,035	2
	Totals	666,619	30,781	5
1900	Goats..	243,397	37,917	16
	Sheep	287,102	7,698	3
	Other animals ..	147,614	3,065	2
	Totals	678,113	48,680	7
1901	Goats..	252,760	36,365	14
	Sheep	283,145	7,256	3
	Other animals ..	155,421	1,558	1
	Totals	691,326	45,179	7
1902	Goats..	252,706	52,092	21
	Sheep	261,204	21,679	8
	Other animals ..	137,582	1,674	1
	Totals	651,492	75,445	12

NUMBER OF ANIMALS COUNTED AND THOSE ALLOWED TO GRAZE, 1894 TO 1927—*continued*

Year.	Animals.	Counted for Tax, etc.	Allowed to Graze.	Percentage.
1903	Goats..	239,348	37,951	16
	Sheep	215,280	14,020	7
	Other animals ..	136,477	847	0·6
	Totals	591,105	52,818	9
1904	Goats..	235,022	40,212	17
	Sheep	209,235	12,340	6
	Other animals ..	144,776	1,066	0·8
	Totals	589,033	53,618	9
1905	Goats..	251,151	30,089	12
	Sheep	236,033	13,911	6
	Other animals ..	158,602	771	0·5
	Totals	645,786	44,771	7
1906	Goats..	248,439	44,193	18
	Sheep	253,138	31,268	13
	Other animals ..	161,787	1,311	0·8
	Totals	663,364	76,772	12
1907	Goats..	239,540	43,930	18
	Sheep	258,960	31,035	12
	Other animals ..	157,730	3,250	2
	Totals	656,230	78,215	12
1908	Goats..	256,345	52,343	21
	Sheep	277,230	34,907	13
	Other animals ..	156,917	4,419	3
	Totals	690,492	91,669	13
1909	Goats..	277,357	24,757	9
	Sheep	301,669	7,426	3
	Other animals ..	163,618	2,243	2
	Totals	742,644	34,426	5
1910	Goats..	276,755	26,008	9
	Sheep	315,847	5,096	2
	Other animals ..	167,203	6,252	4
	Totals	759,805	37,356	5
1911	Goats..	274,345	27,031	10
	Sheep	294,828	5,504	2
	Other animals ..	167,090	454	0·3
	Totals	736,263	32,989	4

NUMBER OF ANIMALS COUNTED AND THOSE ALLOWED TO GRAZE, 1894 TO 1927—*continued*

Year.	Animals.	Counted for Tax, etc.	Allowed to Graze.	Percentage.
1912	Goats..	254,054	24,455	10
	Sheep	259,742	5,171	2
	Other animals ..	171,883	581	0·4
	Totals	685,679	30,207	4
1913	Goats..	255,215	53,425	21
	Sheep	253,607	18,471	7
	Other animals ..	166,354	1,808	1
	Totals	675,176	73,704	11
1914	Goats..	239,037	28,687	12
	Sheep	265,954	4,599	2
	Other animals ..	167,473	1,513	0·9
	Totals	672,464	34,799	5
1915	Goats..	243,739	48,395	20
	Sheep	262,688	21,133	8
	Other animals ..	169,179	1,185	0·7
	Totals	675,606	70,713	10
1916	Goats..	224,308	37,801	17
	Sheep	271,811	16,573	6
	Other animals ..	144,937	1,266	0·9
	Totals	641,056	55,640	9
1917	Goats..	183,707	23,866	13
	Sheep	245,741	4,695	2
	Other animals ..	136,640	2,675	2
	Totals	566,088	31,236	6
1918	Goats..	190,244	15,580	8
	Sheep	253,478	3,875	2
	Other animals ..	150,873	558	0·4
	Totals	594,595	20,013	3
1919	Goats..	183,647	12,904	7
	Sheep	280,115	3,560	1
	Other animals ..	180,371	387	0·2
	Totals	644,133	16,851	3

NUMBER OF ANIMALS COUNTED AND THOSE ALLOWED TO GRAZE, 1894 TO 1927—*continued*

Year.	Animals.	Counted for Tax, etc.	Allowed to Graze.	Percentage.
1920	Goats..	210,995	10,959	5
	Sheep	288,560	3,104	1
	Other animals ..	140,980	521	0·3
	Totals	640,535	14,584	2
1921	Goats..	169,249	11,322	7
	Sheep	266,141	3,370	1
	Other animals ..	132,493	342	0·3
	Totals	567,883	15,034	3
1922	Goats..	228,244	10,368	5
	Sheep	290,343	2,452	9
	Other animals ..	139,193	177	0·1
	Totals	657,780	12,997	2
1923	Goats..	235,405	9,818	4
	Sheep	294,889	3,964	1
	Other animals ..	142,843	125	0·08
	Totals	673,137	13,907	2
1924*	Goats..	226,581	48,223	21
	Sheep	280,883	35,689	13
	Other animals ..	137,960	12,555	9
	Totals	645,424	96,467	15
1925	Goats..	202,052	40,738	20
	Sheep	244,036	25,644	11
	Other animals ..	128,027	3,669	3
	Totals	574,115	70,051	12
1926	Goats..	214,534	35,022	16
	Sheep	244,493	19,429	8
	Other animals ..	30,105†	3,336	11
	Totals	489,132	57,787	12
1927	Goats..	225,821	28,795	12·75
	Sheep	259,718	16,042	6·17
	Other animals ..	41,117	2,949	7·17
	Totals	526,656	47,786	9·07

* Pigs admitted to the Forests for the first time. † Only pigs.

CHAPTER IX

THE DAMAGE OF GOAT-GRAZING TO FOREST TREES AND SHRUBS

FIRST it is necessary to recall M. Madon's verdict on the goatherds. As he rightly says:—

There is another mode of action, or rather destruction, which appertains to it, since wherever he is left to himself the shepherd has a tendency to set fire to the herbs that the spring has brought above the ground, and the first heats of summer have dried up. The flame extends under action of the wind, and in its passage ruins the nascent Forest, but in the autumn the peasant finds dry woods there ready to hand, and in the following spring the soil, enriched by the ashes, yields a richer pasturage for his flocks. These fires occur only in restricted areas in the Island, owing to the want of the material, but the traces of them are found everywhere, and although each one of them extends over but a limited space, they are not the less hurtful, inasmuch as they destroy in a few hours the painstaking work of regeneration during twenty years.

Extract from M. P. G. Madon, *The Replanting of the Island of Cyprus*, September 23, 1881:—

Constant watching will lessen the evil, but it can alone be extirpated by the entrance of flocks into the great woodlands being forbidden. If these means are not sufficient, the prohibition of pasturage in the burnt Forests and collective responsibility will prove more effectual remedies.

Means to be Employed to Arrest these Dangerous Practices

To begin with one lowly plant, the *Origanum dubium*, which yields the very valuable Origanum oil of commerce. This little perennial plant suffers very much

from the grazing of goats, as also its other nearest relatives, *Origanum onites*, *O. hirtum*, and *O. Bevani*. Much the same applies to Marjoram oil plant, *Origanum marjoranoides*.

It is not only the leaves and stem which are eaten by the goat, but also the flower, the most valuable part of the plant for reproduction purposes and continuity of supply of Origanum plants in the Forests. In the Paphos Forest, where the largest quantity of the stems and leaves of the Origanum oil herb are collected, the distribution of it is very varied. In the valleys of Livadhi and Pomos and Kokkina region it is most common. Here also are found some of the most lawless and illiterate shepherds of the whole Island. Even with a grazing area of 24 square miles for about 1,300 goats, the goatherds allow the goats to wander over other very large areas of the Forests. The result is that the plant does not increase and, in fact, appears to be decreasing. In trampling alone, in addition to grazing, the plant suffers excessively, as it is easily bent or broken down owing to its comparative height coupled with slight thickness of stem. It is very noticeable that where the ground is trampled by the goats, close by where such herbs are growing, usually most of the plants die. It would appear that the soil near these plants should be slightly loose and not packed, or all the small amount of moisture available in the soil is drawn out by capillary action through cracks forming in the more hardened ground.

Although the plant is collected year by year and the Government gains a royalty of over a hundred pounds per annum, and the industry yields the country over a thousand, its development is hindered and in constant jeopardy at the hands of a few hundred goats which

really cost the country at least £1 a head in damage. Although the plant grows in fields when sown, it appears on the average to be most easily tended and dealt with whilst growing in the partial shade of the Forest trees.

At a low estimate the yield could be increased tenfold by the exclusion of the goats from the areas where the plant is found growing wild. More work would thus be provided and much economic gain to the whole country.

The damage to trees is both direct and indirect. On the one hand the goat eats off the shoots of all the Cyprus species of trees, except that the dwarf Oak is not so much liked as the Pine or Acacia. It is always a question of alternative kinds of food. However, there is no doubt that the goat prefers the woody growth of seedling trees. The Olive is from observation the most beloved of all trees. The next in this order is the Carob, which is also eaten down to the ground; whereas the Olive, by spreading out into a large bush, eventually is able to form a leader out of reach of the goats and thus finally has a stem and can be called a tree. This process in a goat-ridden Forest will take thirty to forty years, whereas alone and without grazing after six or ten years a tree capable of being grafted would have grown up.

Of the exotic trees the Tree of Heaven is not liked, but still it is eaten if there is nothing else. The Cedar is very much eaten, and fails to sprout up for twenty or even forty years. Despite what the goatherds say to the contrary, the Pine is very much nibbled, especially seedlings. In fact, in many places it is possible to see pincushion-like Pines over twenty years old. Each tree seedling has been eaten down, with the result that the whole forms a tuft of Pine needles like a hemispherical

ball of greenery about one foot high. The goatherd also cuts the young seedlings in order to get the resin out with which to rub on to the udders of the she goats to prevent the kids from taking too much milk.

When the goatherd stays in the mountains, he cuts down at least a dozen seedlings or saplings one to two inches in diameter in order to make a cosy place behind which he can sleep with a small fire in front. In one place, within a distance of a mile from Stavros in the Paphos Forest, no less than fifteen young trees had been cut down or cut through and pushed down for such a purpose. Other larger trees are cut in order to hasten the formation of the so-called pitch wood, which is used for torches. The Eucalyptus is attacked very much, but, if protected, grows out of reach quickly. The Terebinth-tree is liked very much by the goats, and the humble Shinia to a lesser degree. However, one and all have to pay toll towards the upkeep of the goat when grazing in the Forests.

CHAPTER X

THE INDIRECT DAMAGE OF GOAT-GRAZING ON THE SOIL AND SUBSOIL

In the first place, in an ordinary Forest of Pine or other trees, there is a layer of humus, dead needles, or leaves, as well as small twigs of branches. These, if undisturbed, gradually rot and decay and form an ideal seed-bed for the falling seeds from the trees of the Forest. This layer of decaying vegetation acts as a sponge for catching and retaining the falling rain.

It is also the most potent form of manure to the Forest, as in this manner the trees give back part of the mineral and other substances which they require for their growth. At the same time it is well known that in Cyprus, as in most countries, the Forests stand on poor thin soil or rock, which is quite unsuitable for agriculture. It is under this moist layer of humus, soil, and subsoil that the weathering of the rock takes place in the most efficient and suitable manner for mineral salts to be formed ready for the young or old tree's reception.

Any surface disturbance upsets this natural and most important soil-making process in the Forest. First of all the mere wandering of the goat over the surface is sufficient to make holes in it very quickly, especially when overlying rock, as it often does in Cyprus. It thus has more chance to dry out and ceases to be the seed-bed for the young seedlings, which are to form the next Forest crop. Any seedlings already found growing there dry up and die.

Falling rain fills up the holes made by the goat's hoof in the humus, and as a large quantity is thus concentrated in one spot, on what is usually a slope, the water washes away part of the decayed leaves and soil or loosens it to such an extent that particles are set rolling down. Prolong this activity of the goats—they are exceedingly wide wanderers in search of food—and in the course of a few weeks most of the loose surface covering of the soil has gone. If the ground were level, the process would not go on so rapidly; but as most of the Forests are situated on steep slopes the disappearance of the humus is all the more rapid and the annual fall of needles and leaves suffers the same fate, so long as the goats are grazing in the area.

Once the surface covering has been destroyed, the soil, which is usually fresh if not moist under the shelter of the humus, rapidly dries out. Cracks form in it, usually reaching down through the subsoil to the underlying rock. Up these cracks and other much smaller holes in the soil moisture is conveyed by capillary attraction into the air, being evaporated in the process. Thus to a much greater depth than in the ordinary Forest the ground soil is dried out, especially during the summer months. In the winter the rain falls into these cracks, enlarges them or loosens the surrounding soil, and all is washed off the surface of the underlying rock, leaving it quite bare. Even if the process does not go as far as this in one season, it will do so in a few seasons, as year by year the cracks are enlarged by the winter water and make little channels down the side of the mountain-slope.

The result of this process is most marked on the smaller trees, whose roots are exposed or dried out by lack of water. However, the injury to the Forest does

not stop there; even the larger trees lose much of their regular water supply, and the leading shoot, if not the whole tree, dies back. A visit to the Paphos Forest has only to be paid to see this process doing its deadly work in any of the timbered areas grazed over by goats.

With the drying out of the soil, useful bacteria, worms, and other plant-helping agencies either move on or are killed, with the result that the remaining soil is not in a fit physical or chemical condition to fulfil its functions towards the modest requirements of young or old trees. Although trees are often found growing on rocky places, yet they do not grow as tall, straight, or large as in a deep, good soil. Thus, if the humus and surface soil is washed away, the trees do not grow nearly as fast or to such dimensions as under normal conditions. Once the damage to the Forest soil is done, it cannot be repaired without endless expense far beyond the resources of any Forest Department. The effect of the damage is then cumulative to the time the tree or trees are cut down. In fact, it means in Forestry language that the rotation has to be prolonged on such areas where grazing takes place by at least one hundred years. This is not the whole effect, because interest should be charged on the original outlay in creating the Forest by sowing or planting, and the ordinary business man will readily appreciate the difference of having to charge for one hundred more years compound interest on an already large timber capital. It means really that profitable timber crops cannot be grown. Once the soil has gone, it is not a long time before the subsoil—which may be fairly deep, but is usually uncommonly shallow in the Forests of this country—will go.

Being nearest the underlying rock, it represents the weathered rock in its earliest and unassimilable form, so

far as plants are concerned. It has not had the play of the sun, rain, and air on it to change its insoluble and even poisonous substances into useful plant-nourishing materials. Usually it is very stiff and compact, a factor which militates against the ingress of root hairs and roots. Only in the most favourable pockets of looser soil are these found. The subsoil at the deepest point merges into the solid rock or whatever geological stratum is found underneath.

Without a covering of soil, this next layer is exposed to the sun, air, and rain, which on an absolutely level place may be most beneficial, yet on a slope simply leads to its substance being all too hurriedly disintegrated and washed down and away out of the Forest. Under the proper Forest conditions this subsoil gradually becomes sweeter and softer as water percolates slowly through, soil bacteria and other natural agencies having ample time to play on this comparatively unyielding material. Time is the essence of the process, and except for mechanical working in a stone crusher or other machine, cannot be turned into soil in any other way, save at a prohibitive cost.

The process of desiccation and destruction is at the same time proportionately hastened by the further trampling of the hoofs of the goats, which in turn, on the one hand, hardens the softer elements of the subsoil, and on the other breaks off harder pieces which roll down the slope. Small or large stones are also dislodged sooner or later and tumble down at an increasing speed, doing damage to young seedlings or trees in the way. If goats are observed carefully for a time, it will be seen how seldom they are standing still, but usually ambling from tree to tree or bush to bush or climbing up trees or rocks. Other animals do not

wander about nearly so much. The number of small paths and tracks on a mountain-slope in Cyprus are eloquent proof of the climbing capacity and energy of the goat.

Once the subsoil has disappeared, the underlying rock is exposed to the blazing sun of the summer and extreme cold, if not frost, of the winter. On the level this is a salutary process for breaking up the rock and weathering it, provided it is covered with some vegetation; in the open and on a slope the conditions could not be more disadvantageous from the Forestry point of view. True, the rock is weathered, but any small particles of soil or stones which form thereby are as promptly washed away. Such a place simply remains bare, and in the nature of the case it must remain so. There is absolutely no chance for any soil to remain long enough on the site to enable seedlings to maintain a roothold.

It is true that a few trees are seen growing on rocks, but this is the result of a pure chance of a seed having fallen into a deep crack in the rock, where a little moisture and the weathering of the rock has enabled it to grow, but such instances are few and far between.

In the main the laying bare of the rock leads to the utter desolation of the area as far as tree growth is concerned. Once the rock has begun to disintegrate, small pieces roll down the slope—later, larger pieces; there is eventually on that place a more or less regular slide of stones, gravel, and particles of weathered rock. These, owing to their wearing the undersurface bare, make what are called screes, on which nothing will grow as there is an entire lack of soil or moisture. In the nature of this formation, it is impossible for water to find a resting-place or any soft substance of a soily

nature into which it can soak. Water falling on such a place simply runs down the slope, carrying small stones and bigger rocks as it gains momentum the greater distance it descends, with the result that at the end of the slope even large boulders are carried down and often deposited outside the Forest on some arable field. Thus it is not only the Forest which suffers endless damage, but even the fields outside.

Although a somewhat lengthy account of this subtle and yet never-ending process of destruction of the soil and its fertile condition has been given, those who have travelled much in the Cyprus Forests know it to be true; it is addressed rather to others who do not know and have not seen these fatal effects of goat-grazing in the Forests. Certainly I should be one of the first to affirm that without actual examples of such damage and following its course, if only for a few years, it would be hard to believe that such a small animal could eventually, by its persistent tread, cause such untold harm to the Forests of Cyprus. I commend everyone to visit the Forests, see for himself, and be convinced.

CHAPTER XI

THE INDIRECT DAMAGE OF GOAT-GRAZING ON THE WATER SUPPLY OF THE ISLAND

As it is now, except for a minute area of Salamis, Limassol sand drift, and of Troodos Forest, there is no normal stocking to be found in the Forests of Cyprus—in other words, in all the Forests the trees stand too far apart to cover the soil properly. Although the age of the standing trees varies from five years old to nearly four hundred, they are not found in sufficient numbers on any given unit of area, so as to form that close canopy which is necessary to preserve the water-conserving capacity of the soil.

The rain or snow, as the case may be, falls on comparatively bare ground, very rapidly melts in the case of snow, except for the summit of Troodos (6,400 feet), and runs down the slopes into the nearest gorge or valley. Here, again, the covering growth of trees and plants is insufficient to check, even for a short time, the down-rushing water. Owing to the small size of the Island, it is nowhere a great distance to the sea. Even in comparatively dry winters some water runs out into the sea from the mouth of the Pedias and Yalias Rivers. It is true much water is absorbed into the soil of the Messaoria in the tortuous course of these rivers in flowing from their respective sources in the Machera Forest, yet these are exceptionally long for Cypriot rivers.

For the same reason there is a certain amount of

time for the water to sink in. However, a glance at the map of Cyprus will show that most rivers are far shorter, and thus rain-water is very quickly conveyed to the sea. On November 12, 1922, I witnessed an example of this at Poli. The first rain-storm of the season occurred accompanied with wind, thunder, and lightning. Within half an hour of the starting of the rain, the sea for over a mile from the shore was discoloured to a dark brown by the dirty water flowing out of the Poli River. One branch of this river rises in the open near Dhrynia and the other in the Stavros Valley of the Paphos Forest.

Everywhere there is such grazing of sheep, goats, and other animals, so that the ground is covered with a minimum of trees. Even allowing that a good deal of rain would rapidly run off the cultivated land, from the other branch of the river the flow should have been comparatively slow, yet it was very rapid. There are a large number of animals grazing in the adjacent areas, and these have been grazing on and off with varying numbers for many years. The result of this is seen in the somewhat bare slopes, crooked trees, and lack of shrubs and seedling trees. The greatest distance the water has to run from the source of Stavros River is only about twenty miles.

The maximum height from which the water starts is about 4,000 feet above sea-level, and thus there is only a short distance to traverse before reaching the sea. Even if the Forest cover were ideal, there would still be a certain amount of quick run-off; but to see the Poli River in flood as I did in 1922 would convince anyone of the disastrous consequences of allowing the slopes to remain uncovered or only partially clothed with trees.

Considering that there are at least 460 streams or river-beds entering the sea round the coast of Cyprus, it can be easily understood how much water is lost in the winter. As has been shown, this is mainly due to the grazing in the Forests destroying the natural cover of the soil, and thus allowing the most rapid possible run-off of the rain falling on the ground.

It is all the more a loss to the Island, inasmuch as the chief season of rainfall is the winter, and little or no rain falls in the summer months. In the winter there is far less evaporation, so that more water perforce can be either absorbed into the ground, if conditions are favourable, or run down bare slopes into the sea. The hard and sharp hoofs of the goats trample the ground down during the summer months to such a state of hardness and bareness that the rain of the early part of the winter is obliged to run off the surface into the nearest gorge or gully, and thus rapidly finds its way into the sea; it can be safely said that no other known process of beating the ground in the summer is half so effective as the goats' hoofs in making the ground almost impervious to moisture.

The results are aggravated by the fact that the early autumn rains in Cyprus are often very heavy, as much as an inch of rainfall per hour being a common occurrence.

CHAPTER XII

THE INDIRECT DAMAGE OF GOAT-GRAZING ON THE COMMUNITY IN GENERAL

FIRST of all the fact must be stated that goats have been the cause of danger to Foresters working in the Forests. Some five years ago one of the Assistant Conservators of Forests had just sat down to eat his lunch, whilst in the Paphos Forest, when he heard the rumbling noise of falling rocks. He hastily jumped up to see what was happening, and the next moment several large stones fell on the place where he had been sitting, incidentally smashing his watch and entirely spoiling his food. This leads to the consideration of the damage done each year to the community at large through the dislodging of rocks, boulders, and stones, which hurtle down the steep mountain-slopes, and either smash trees or more often fall finally outside the Forest into someone's field. The particular individual owner of the field may scarcely notice this from year to year, but at the very least it reduces the yield of the field, makes extra work in clearing it, and may in time actually lead to the field being abandoned as not worth cultivating. No one takes any notice of this, but it is the whole community on whom the ultimate loss really falls, though no one has actually to find any money with which to pay the damage. It is nevertheless there and the country suffers by its lack of fertility or lessened crop yields.

It is this kind of loss going on year after year which is so imperceptible, and yet so insidious, and one which

it is so difficult to bring home to anyone and make him or the community understand why it should be hindered, if not absolutely eliminated. Take, again, a similar, but parallel case of damage. A goatherd has a grazing permit in a Forest, and occasionally each summer sells some of his kids and goats. These are driven down to the edge of the Forest by a rough track or path, as the case may be, and then through or over other persons' fields or even at the side of them.

As no one has yet thought of muzzling a goat in passing through someone else's property, the goat eats whatever is at hand—grain, herbs, shrubs, fruit-trees, and so on. In one field little or no damage is done, in another more. Nevertheless, unless the goatherd stops some time at one place, very few of the landowners notice or know about the damage until it is too late either to see or find out the name of the goatherd, the number of animals, and other necessary particulars. In many cases the damage on that particular day is not so extensive or severe that action can be taken with any certitude of success with sufficient compensation to pay for all the trouble and worry to the owner, the Mukhtar of the village, and others who have to assess the damage. In very many cases of small or passing damage, no notice is taken, or at any rate no compensation is demanded or paid. However, the community pays by a loss of crop or fruit or damage to a fruit-tree which subsequently dies.

Capital which was saved has been thrown away, in the loss of time which was taken to raise or buy the fruit-tree, and the wretched owner has to begin again. Now considering that there are at least 46,000 owners of property in Cyprus and over 2,000,000 individual holdings, it will be seen how large in the aggregate is

the unrecorded damage done to crops, fruit, and other trees of individuals. What is the gain? One illiterate goatherd is kept in comparative idleness at the expense of the community, and a few gaunt goats produce some dirty milk, inferior cheese of various kinds, and poor leather, none of which can be exported. As a very experienced official in Cyprus once said: "From the goat the Cypriot gets ten shillings' worth of produce in a year and over one pound's worth of damage"—it is very evident on which side of the ledger the account stands at the end of each year.

At a low estimate, I should be inclined to calculate that the country loses by this petty damage at least £10,000 a year in sound wealth-producing objects, most of which could be exported at a profit to the community.

The Chief Commandant of Police has very kindly placed at my disposal the figures of the damage assessed under the Rural Constable Law for the five years since the Law came into operation:—

Year.	Amount Paid to Government.			Amount Paid to Private Persons.		
	£	s.	d.	£	s.	d.
1923	66	17	2	358	18	2
1924	1,301	10	4	6,795	1	4
1925	1,162	1	0	5,901	9	3
1926	1,111	10	5	5,940	4	3
1927	1,009	11	4	4,890	1	8

From this it will be seen what a toll is taken from the crops by animals grazing, as well as other malicious damage. The cases of minor damage are not taken up. No estimate of the loss of time and other expense caused by collecting this compensation is included in the above account.

CHAPTER XIII

THE INDIRECT DAMAGE OF GOAT-GRAZING ON THE ANIMAL-BREEDING INDUSTRY

FROM a perusal of books on agriculture it appears that goat-grazing of a semi-nomad character in the coniferous Forests, such as those of Cyprus, is inimical to the breeding of the highest type of animal either for milk, cheese, meat, or leather supply. It is true that in many countries, owing to the lowly character of the goat in the family scale of domestic animals, the subject has not been given as much attention as it might have had, or should have in a country such as Cyprus. Most enlightened farmers try by all means in their power to raise milch cattle rather than goats.

The ameliorative treatment of the animals by better grazing and feeding near or in an adjacent village and under close supervision is beginning to yield much improved financial results.

Some of the commoner effects of grazing in the Forest are:—

(i) Loss of kids by foxes each year.

(ii) Loss of both kids and goats by disease, owing to the distance the shepherd is from skilled attention or timely veterinary aid. Ignorance, apathy, and laziness militate against the goatherd seeking advice or accepting it.

(iii) Loss of animals by the unfavourable weather conditions and lack of proper shelter, especially in the winter months.

(iv) Lack of early and strong maturity of animals, due to the difficulty and comparatively long distance the goat has to go in order to find sufficient nourishment from the rough herbs, shrubs, and trees of various kinds growing here and there in the Forest.

(v) Lack of vitality and strength of breed, due to breeding in much the same stocks from year to year. In the Forest under Cyprus conditions the goats are only removed from the Forest as kids, or when they become old, for sale to be killed.

(vi) Lack of softness or tenderness of flesh, owing to the goats having to jump about over rocky ground. For this reason the animals gravitate almost to the rank of wild beasts of the Forests.

(vii) Lack of tameness of the ordinary domestic animals causes the goatherd to waste much time in catching them, even for milking purposes.

The smallness of the average size of the animals which usually graze in the Forest compared to the animals, which are tethered or led to pasture or fed with leaves of trees near a town, such as Nicosia, is startling and almost incredible.

The damage to the udder due to the goatherd rubbing on turpentine from the Pine-trees in order that the kid may not take the whole milk supply, though, under proper conditions, this matter can be regulated and adjusted to the type of animal kept.

Goats continually grazing in the Forest yield only one-quarter or, at the most, one oke of milk per day,

whereas those properly fed will give at least one and a half and even two okes per day.

The hair is very short and poor compared to an animal kept under modern conditions outside the Forest. It is strange that although the Angora goat has been such an earner of money in South Africa, it has not been made to yield good results in Cyprus. It is doubtful whether in recent times any of the pure-bred Angora goats have been introduced into the Island.

CHAPTER XIV

THE MODERN METHODS OF KEEPING GOATS

DURING the war the interesting example was seen of how goats could be kept healthily and thriving in apparently uncongenial and comparatively confined surroundings in England. Persons who had a small piece of ground or garden, divided off a small piece of it and fenced it in properly with wire of sufficient height. In one corner of the enclosure, or at some distance away, a small goat-shed was put up with a sufficient number of stalls, as well as feeding-bins for the total number of goats being kept. By day the goats were put out in this enclosure or tethered on a piece of rough land. On no account were they allowed to wander. At milking-time they were brought into the stalls and milked; in the evening after this had been done they stayed in the stalls all night.

Small twigs of branches of trees and shrubs were given to the goats by day, as well as scraps of all kinds, chiefly of a more herby or woody nature. For the best milkers prepared food of grain was given once or twice a day according to the type of goat. As the goat is practically as omnivorous as the pig, there was little or no difficulty in feeding it, even with the chronic shortage of food then prevailing.

It was noticeable that the goats did not eat grass to any extent, much preferring woody twigs, including gorse. The tethering presents a constant problem, but with a stout rope or chain and an iron peg driven at

least nine inches or a foot into the ground, this active animal can be kept on a small area. The length of rope varies from twenty to forty feet according to the area of ground where the goat has to be kept.

In its stall it is haltered in a similar way to a horse, but with a collar and chain. In the open it can be allowed loose, so long as the fence is high enough (say, at least eight feet) to prevent it jumping over. In some cases wire netting can be put over the top to make quite sure that this climbing animal does not stray.

Conditions in Cyprus appear to be quite favourable to the keeping of goats either tethered or partly in stalls and pens. In fact, already near the towns many led or tethered goats can be seen. With the economic pressure to keep animals off other people's property and yet rear them cheaply, the more modern method of keeping goats will doubtless take greater hold. Offers of cut material from the Forest have been made, but as often refused by the goatherds, though hay from plantations has been sold for cattle-feeding.

CHAPTER XV

THE CHANGE FROM PASTORAL TO AGRICULTURAL METHODS IN CYPRUS

FROM a perusal of the Blue Book returns of all the animals it is seen how sheep have fluctuated between 315,000 and 193,000, goats 277,000 to 169,000, and pigs 64,000 to 15,000.

On the whole, the total has not altered very much in forty-eight years. In 1880 the number of sheep and goats was 447,980 and in 1926, 459,027, whilst the pigs had increased from 15,744 to 34,769 in 1924: thus the pigs have more than doubled in number. Although no figures are available until a much later date, it is well known that in the early 'eighties the goatherds grazed their flocks everywhere without let or hindrance, especially in private property or *hali* land.

In connection with this the figures for the area cultivated should be studied, also those for the number of shepherds, farmers, and landowners, according to the various census returns.

The main point is that a very extensive system of agriculture with many goatherds was the prevailing state of the industry in the early 'eighties: the pastoral element was the stronger of the two sides of the industry. The number of abandoned *mandras* in the plains is eloquent testimony that this was so. There are at least five places of the name of Mandras, which clearly shows their origin, and in some cases it is definitely known that it is only since the British occupation that

these places have been permanently inhabited and proper houses built there.

In the hotter districts it is not usual for the pigs to be allowed to wander at free will, so with double the number now in existence the question must be asked: How are they kept? All these are fed and kept in regular sties and usually only wander in certain well-defined areas near villages or farms.

It is generally recognized that all the animals, except goats, have increased in size during the last fifty years, chiefly owing to the care in selection and the great efforts made by the Agricultural Department to produce better and stronger breeds of animals, which will be kept under better conditions on the farms.

These efforts have been most successful, to which the figures on p. 125 bear ample testimony.

Quite apart from the change in the value of money, the cattle, sheep, and pigs are much more valuable as live stock either for the market or the table than they were fifty years ago.

In the *Notes of Agriculture in Cyprus and its Products*, Mr. W. Bevan, then Director of Agriculture, gives an illuminating account of the goatherd under the heading of "Goats":—

> The goat has been a cause of much controversy for many years and a source of discord between farmer and shepherd. Owing to the absence of farm boundaries the herds of goats (and sheep) continually trespass on the cultivated areas, and the shepherds are at little pains to restrain them where there is a chance of the animals getting a good meal. Large sums in the aggregate are paid by way of fines and damages, but the shepherds evidently find that even so it is profitable to continue such practices.
>
> They are, however, great enemies to Agriculture and Forestry, and if they are to be preserved in the Island, it is essential that both they and the shepherds be brought under strict control.

SHEEP, GOAT, AND PIG TAX ASSESSMENT FROM 1878–1927

Year.	Sheep.	Goats.	Total.	Pigs.
1878	—	—	535,383	17,840
1879	—	—	522,145	18,068
1880	237,224	210,736	447,960	15,744
1881	237,374	202,615	439,989	18,305
1882	262,472	249,776	512,248	26,335
1883	297,918	270,408	568,326	32,324
1884	298,977	262,060	561,037	30,114
1885	311,246	272,622	583,868	30,090
1886	313,864	282,021	595,885	24,822
1887	289,692	252,633	542,325	17,737
1888	213,406	218,593	431,999	15,315
1889	193,623	209,709	403,332	21,968
1890	210,868	237,475	448,343	31,779
1891	229,789	248,925	478,714	37,622
1892	240,792	264,808	505,600	37,598
1893	253,533	247,112	500,645	29,099
1894	245,834	226,451	472,285	29,101
1895	252,904	221,883	474,787	34,261
1896	272,122	251,819	523,941	35,037
1897	294,374	263,750	558,124	33,588
1898	290,888	270,841	561,729	29,075
1899	277,828	253,572	531,400	26,421
1900	287,102	243,397	530,499	34,637
1901	283,145	252,760	535,905	38,778
1902	261,204	252,706	513,910	36,061
1903	215,280	239,348	454,628	29,512
1904	209,235	235,022	444,257	37,377
1905	236,033	251,151	487,184	45,357
1906	253,138	248,439	501,577	45,688
1907	258,960	239,540	498,500	36,079
1908	277,230	256,345	533,575	33,952
1909	301,669	277,357	579,026	31,690
1910	315,847	276,755	592,602	35,181
1911	294,828	274,345	569,173	35,883
1912	259,742	254,054	513,796	40,424
1913	253,607	255,215	508,822	37,006
1914	265,954	239,037	504,991	38,822
1915	282,688	243,739	526,427	34,735
1916	271,811	224,308	496,119	27,332
1917	245,741	183,707	429,448	29,117
1918	253,478	190,244	443,722	45,880
1919	280,115	183,647	463,762	64,455
1920	288,560	210,995	499,555	32,431
1921	266,141	169,249	435,390	16,765
1922	290,343	228,244	518,587	33,614
1923	294,499	235,405	529,904	39,356
1924	239,672	179,555	419,227	34,769
1925	244,036	202,052	446,088	30,935
1926	244,493	214,534	459,027	30,105
1927	259,718	225,821	485,539	41,117

In Cyprus most of the goats have very short hair, which cannot be shorn. From this fact, and from the external shape of the animal, one may infer that it is either a variety of the Anatolian breed modified by local influences or a hybrid of the Numidic or Anatolian breeds.

From observations made in Africa, I incline to the latter inference, as the Cyprus goat has the small size and shape of the African, also the short hair.

It is strange the goatherd has not adopted the methods of the pig-keeper and raised a better breed during the last few decades, as has been the case with the pigs.

The passing into Law of the Bill to provide for the exclusion of goats from the area of a village on the vote of the local population has undoubtedly altered the system of keeping goats, though not very radically. Between 1913 (date of enactment of the Goat Law) and 1926, 140 out of 648 villages, 145 Chiftliks, two Tekkes, and 58 monasteries balloted against the goats.

During the last twenty years the process has been accelerated by the introduction and operation of about 2,500 air-motors in order to pump water up for the irrigation of orange and other gardens, chiefly in the Famagusta District. Over one thousand air-motors have been imported in the last seven years.

Thus horticulture is playing a greater rôle in the rapid amelioration in the standard of living of the peasant compared to years ago, when he was either a goatherd or a very poor arable farmer.

CHAPTER XVI

THE IMPROVED ECONOMIC RESULTS ALREADY ATTAINED WITH LESSENED GOAT-GRAZING IN THE FORESTS

IT is only necessary to consider the following extract from M. Madon's report on the *Forests of Cyprus*, 1881, to see what a change has taken place within a period of forty-six years:—

> I dare hardly estimate at one-fifth the surface annually or periodically cultivated, for fear of this being exaggerated.

From the various handbooks and Blue Books, as well as information very kindly supplied by the Director of Land Registration and Surveys, the following table shows progressively the increase in the cultivation of the land for agricultural and garden purposes:—

PERIOD	ARABLE LAND Acres.
1879–1890	1,292,713
1890–1900	1,303,415
1901–1910	1,313,640
1911–1920	1,318,980
1921–1924	1,323,140

The details for the period 1921–1924 are as follows:—

	Acres.
Arable Land	1,323,140
Vineyards	104,025
Merras	8,369
Private Forests	3,145
Hali Land	134,704
Roads	4,656
River-beds	107,520
Actual Village Sites	194,256
Actual Town Sites	5,473
Forest Area	409,947

Total area of the Island is 2,292,760 acres.

About 1,500 acres of private Forest lands were included in the agricultural area of the country. There are also just over 2,000,000 Carob- and 1,400,000 Olive-trees standing in private properties, compared to less than half that number thirty years ago. Although the goatherds complain of being oppressed, their number has increased. The number of fruit-bearing trees has increased enormously, apart from the Carob- and Olive-trees already mentioned.

During a period of nearly fifty years at least 36,000 acres, if not 40,000, have been sold to individuals for cultivation; also 34,560 acres of Forest land have been alienated for the same purpose. During the same period the number of animals has remained practically the same, and many additional fruits, as well as other crops, such as potatoes and flax, have been raised. The country generally has gained very much in wealth by the more intensive utilization of the soil. Indeed, it appears that this is the clearest proof that animals can be kept under other conditions than by grazing in the Forests. With a still greater intensity of cultivation, a larger number could be kept on the land than now. The yields have already been increased by manuring of the fields artificially, as well as by the animals in the fields, but there is still room for a much greater development in this direction.

Shifting cultivation, of which M. Madon wrote in his first report, has practically ceased, except for the areas cultivated on the sly at the edge of the Forests. Much of the cultivated land has gone out of cultivation simply from being subjected to a system of wasteful agriculture. The lack of walls and terraces clearly shows the disastrous effects of such methods, as there are at least 200,000 donums of such land in the Island. The

fallow is still scarcely used, and is certainly not weeded as it should be if it is to serve its true purpose for the conservation of the moisture each year. In the years of very heavy rainfall it does not appear to be necessary, more especially if a few animals are allowed to be grazed on it, or a nitrogen-making deep-rooted crop is grown.

Although it is not possible to find out all the areas of new garden lands, yet the proportion to what it was years ago must be high.

CHAPTER XVII

THE ECONOMIC RESULTS OF THE PRESENT GRAZING SYSTEM IN CYPRUS

At the present time there are about 60,000 animals grazing in the Forests, of which over 35,000 are goats. This number of goats is excessive considering the products and benefits which the Forest has to yield to the community year by year.

The Forests of Cyprus now comprise less than one-fifth of the land area of the country, yet the rainfall averages seventeen inches and varies from under ten inches to over thirty on a small area of the northern range. As it is, general complaints are being made of springs drying up and there being shortage of water, even for drinking purposes, in the villages. It is also noticeable that the villagers, if possible, obtain permission to run pipes into the Forest to tap perennial springs there.

An area of about 400,000 acres of Forest out of a total area of 2,293,760 acres is naturally not large enough to conserve sufficient of the rainfall for the necessary springs and water. For the proper cultivation of the soil, with a comparatively low rainfall occurring in the sub-tropical climate with its very clear, hot weather, high temperatures, and excessively warm desiccating winds, the present water supply is insufficient and adds to the task of the Foresters. It is only by the most careful husbanding of the water and the Forest resources that commensurate results can be obtained; to ensure suffi-

cient, Forests covering at least 40 per cent. of the land, or double the present areas, are required. It is interesting to note that this was recommended by M. Madon in 1880, when he stated 900,000 acres should be used for growing Forest trees, of which 600,000 should be devoted to the Carob and the Olive, and 300,000 to reafforestation. It should be noted that this was in addition to the preservation of the existing Forests.

As it is, even the real Forest area cannot perform its proper function, owing to the fact that in trampling alone, the surface is rendered too hard for the rapid reception of falling rain, which thus runs down the steep slopes all too quickly. The killing of immature seedlings, and other arborescent growth by the goats, still further makes the passage of the falling water easy, and thus increases its volume and speed. This process takes place season after season, so that its cumulative effects on the Forests are disastrous. First of all the increment on the trees is reduced by the desiccation and loss of soil. Natural regeneration, which is so urgently needed to replace old trees, is killed out. Roads and paths are made impassable, and costly clearing of them is necessary more than once a year. Although the Forest has to be protected, whether in a good or bad condition, so this factor of the cumulative damage to the Forest by the goats makes the Forest more expensive to manage. On the other hand more timber could be cut, and a much greater net revenue would be obtained if the trees were allowed to grow properly without this continual strain on their vegetative resources by goat-grazing.

With more water being conserved in the Forest itself, the growth of individual trees would be much accelerated, and trees would reach maturity probably

at least seventy years sooner than they do now. An interesting example of this is to be seen on the slope above Stavros, which has been used for grazing for many years. The age of the trees is 145 years, and they are now nearly mature. On similar soil and under similar conditions elsewhere, the age of maturity is about 70 years.

The economy in the remaking, cleaning, and clearing of Forest paths and roads would save several thousands of pounds for other more urgent work, such as re-afforestation of burnt and bare areas.

At a low estimate an increment of 1,000,000 cubic feet is being lost every year in the Cyprus Forests, through goat and other grazing damaging seedlings, trees, and soil. One million cubic feet of timber standing in Forests is worth about 4½ cp. per cubic foot, or in all £25,000. Thus year by year the Cyprus people lose over £25,000 of timber for the sake of benefiting a few shepherds. The real indirect loss is far greater as it is more difficult to calculate, yet it is there all the same.

The lack of water in Cyprus is well known, yet few people understand its paucity is due in large measure to the enormous amount of grazing tolerated in the Forests. For agricultural and domestic purposes, it is safe to say that the extra water, which would be conserved in the Forests, would be worth £100,000 per annum.

With the greater number of trees the rainfall would be increased and thus ensure better crops each year, as well as increased growth in the Forest itself. Much of the present waste of rainfall running down the valley into the sea in winter months would be avoided.

The trees act as a sponge, both with their branches

and their roots, with the result that some of the rain is re-evaporated and falls again as rain; some falls to the ground and is absorbed into the soil instead of rushing down the slopes into a valley leading to the sea. It has been estimated that rainfall in a Forest takes from six to twelve months to percolate right through and form springs.

CHAPTER XVIII

THE ALTERNATIVE MEANS OF LIVELIHOOD ON THE LAND NOW OFFERED TO THE GOATHERDS

M. MADON'S concluding remarks in his report on *The Preservation of the Forests of the Island* bear recalling:—

But the preservation of the last Forest calls for urgent measures, and expenses for this delay would not at all be convenient; one cannot take half measures, and a badly placed economy might compromise the whole result.

It is necessary, therefore, before anything, to produce seedlings, and for this reason to reduce the fellings, first of all, to what is strictly necessary in order to preserve the old fruit-bearing trees already too rare; in order to protect the soil, to prevent the abuse of cutting the undergrowth, since it is very valuable for binding these very shifting soils, and to permit of the seedlings taking root; also to restrict pasturage as much as possible, which is the principal cause of the disappearance of seedlings, and to prohibit entirely the entrance of goats into the Forests.

Referring to the Aleppo Pine, he says:—

The secret of their regeneration, then, is a very simple one, and consists, above all, in preventing the direct and indirect destruction of seedlings by the goats.

The measures to be taken will stop the ancient bad habits of the population, and it is hardly avoidable that they should have a rebound on their agricultural and domestic economy; but the situation is so critical, the injury so far advanced, that one no longer has the choice between Forest and pastures, but between agricultural and pastoral life: the former with its numerous resources, its brilliant future, and the rise it gives to industry and commerce; the latter with its products more and more confined by its own abuse, its precarious future, and the mortal agony in which it plunges its people. One cannot think of depriving the inhabitants of indis-

pensable resources; even besides the immense progress that agriculture can realize on the plains, the culture of vines, Carobs, Sumac, the introduction of Chestnuts, and the progress of the Walnut-tree can, in a few years, lead in mountainous populations to a degree of prosperity that they have never yet dreamed of. With the present development what would be the result? The secondary improvements would promptly be realized, and before the present generation has vanished the Island would be irrecognizably changed, but as at all times of transit, the first year's present inevitable difficulties, which would be softened as soon as possible, not by slacking the measures, which would lose their efficiency, that can only justify them, but by holding from the commencement to the path to be followed without hesitation, interruption, and irregularity.

From the Forestry and general economic view of the country's welfare M. Madon had the clearest idea of the real solution of the problem of preserving and improving the Forests. After reviewing the work of the last forty-eight years, everyone will agree that he was right, though at the same time anyone who has observed the present-day conditions will see that the goat still remains the Cyprus Forest's worst enemy. From what has been stated under the section on the change from pastoral to agricultural methods, it is clear that the goat can quite well exist without access to the Forests.

From the figures obtained from the censuses of 1891 and 1921, it is clear that, despite all desire to restrict the goat-grazing in the Forests, the shepherd has held his own. No information is available from the census of 1881. In the table on p. 136 the numbers of shepherds, farmers, and the proportion to the whole population are given.

Even now the proportion of shepherds to the total population is slightly greater than it was in 1891. More regrettable is the fact that the ratio of farmers to total population has not increased more than just over 3 per

DISTRIBUTION OF POPULATION IN SHEPHERDS, FARMERS, AND LANDOWNERS, 1891–1921.

	1891.	1901.	1911.	1921.
CULTIVATED LAND .. .. acres	1,292,713	1,303,415	1,313,640	1,318,980
POPULATION	209,286	?	274,108	310,715
SHEPHERDS—				
Males	4,458	5,933	6,764	6,915
Females	247	326	572	429
Totals	4,705	6,259	7,336	7,344
FARMERS—				
Males	14,878	12,836	27,743	31,927
Females	727	806	1,620	1,490
Totals	15,605	13,642	29,363	33,417
LANDOWNERS—				
Males	27,328	27,638	446	—
Females	7,420	7,700	185	—
Totals	34,748	35,338	631	46,321
PERCENTAGES—				
Shepherds to Farmers	30·15	45·88	24·98	21·97
Shepherds to total Population	2·24	2·64	2·67	2·36
Farmers to total Population	7·45	5·75	10·71	10·75
Shepherds to Landowners	13·54	17·71	62·59	15·85
Landowners to total Population	16·60	10·69	0·23	14·90

cent. It is noticeable that during the period 1901–1911, when the restrictions on grazing were more strictly imposed, the shepherds were actually reduced in proportion to the total number of the population. An increase of only eight during the decade 1911–1921 shows that the country can do without the thousand shepherds which were added in the previous ten years.

The time has come when all animals should be kept in proper fields, and not be allowed to roam over open cultivated lands. The Island is too small in size to tolerate such a system any longer. Added to that, with the increasing supplies of water, more intensive forms of husbandry can be practised to the benefit of everyone, including the best farmer, who keeps his animals on a modern agricultural system.

After a great deal of preliminary investigation and inquiry amongst goatherds, smallholders, and the Forest Staff, an alternative means of livelihood has been worked out and proposed to the villagers of Livadhi, Kambo, Vroisia, and Ayios Mercourios. During the last five years, by talks with the villagers, it has been suggested that where a goatherd is willing to sell his goats for killing or to others living in villages away from the Forests, land would be given to him ready cultivated, planted with fruit-trees, as well as provided with a constant supply of water from a well or water channel.

In the first place the Forest Department chose a site of suitable land in the Kambo Valley for the Kambo goatherds, as well as another Smyes site in Akamas Forest, to which the Livadhi people might go. Both schemes are now in working order. In the former case four men have agreed, and in the latter about thirty-seven are preparing the ground and planting it.

The usual plan means starting with an individual goatherd, who is offered land at the rate of one donum for every ten goats, which are disposed of or sold. An agreement is usually made, but as yet not always enforced. The Forest Department then prepares the land, ploughing, and, if necessary, trenching the whole area. If the ground is not level, a dry stone wall is built on the lower side and the ground levelled up in one or more terraces. The area is fenced in by wire or other means, and, if more suitable, a wall may be put up. The area itself is connected up with the nearest road or path, so that it may be possible to carry produce out or bring manure, etc., into the place. The path is made in such a way that at a future date it can be widened into a cart-road.

Whatever quality the soil may have, the requisite manure is brought on to it in order to raise it to at least the level of the average garden land of the nearest village.

The goatherd is asked the species of trees he desires to be planted on the area and the number of each kind. Unless the trees named are quite unsuitable to the locality, they are procured and put in. Due regard is, of course, paid to the kinds recommended by the Agricultural Department for that district. The aim is to plant those which are most profitable, and appear to be most suitable in every way at the present time, and in the near future.

If there is no stream or other water-course from which water can be taken, a well is dug or a supply brought in a channel from the nearest place. According to the request of the goatherd, a wooden or iron plough is supplied free of charge, as well as an iron spade, fork, mattock, and wheelbarrow. Seed of any kind is also supplied according to the choice of the applicant.

A small toolshed is erected on the site in order to make the area self-contained, and as it may be some distance from the village, it is estimated that one shed would do for thirty donums, but if animals are kept, provision will be made for more. It has, however, been considered that one is sufficient for a proper economic start to be made by a goatherd beginning this new kind of livelihood. The value of this smallholding and its equipment is estimated at nearly £60.

If the goatherd desires, he can be employed on all these operations during the period when they are being done. In that way he can earn much more money than he would lose from the income of the first lot of goats sold. Anyhow, by a little care and calculation, he need sell only sufficient so that by hiring himself out for Forest work he can earn as much as his income was from the first lot of goats sold.

In the second year the same process may take place. When a further area of a donum is cultivated and more trees put in, perhaps some more walls and terraces are necessary; if so, employment is provided. If there is less employment available there, other work is provided in the Forest.

The third year sees some increasing income accruing from the trees planted in the first year; also vegetables and other crops are grown between the fruit-trees. If the goatherd does not require employment, then another can be employed in getting land ready for the next year. A further donum is cultivated in the fifth year, when the goatherd who possesses fifty goats will have sold all and be in possession of five donums of fully planted cultivated land surrounded by a wall or fence of a level nature, provided with proper tools, a shed, and water supply.

If at this stage in the development of the scheme it is found that the income falls short of what the man was receiving before, the intention is to offer Forest or other work at the saw-mills until the smallholding is self-supporting. In Cyprus it appears that most smallholdings with a good water supply are economic propositions. All through, of course, the point has been stressed that the land will in the first place be brought to a high state of cultivation, equal to the best garden land of the nearest village. In this way it is hoped that the returns from the land will be such that any reasonably active goatherd will be able to earn a living as easily as any others in the village who may own garden lands there.

As an alternative to goat- or sheep-grazing in the Forests, offers have been made by the Forest Department to cut forage and sell it at as low a rate as possible to stock-keepers in order to provide a cheap means of feeding their animals. Unfortunately these attempts to improve the existing situation have met with no success. However, in the near future, still greater efforts will have to be directed to this end.

For over thirty years the Agricultural Department has done its utmost by the introduction of a first-rate breed of cow and bull to improve the local stock, as well as provide milch cows. The farm at Athalassa has only to be visited to be convinced that very valuable work in animal-breeding has been and is still being done.

A further step was recently taken by the sale of a large number of milch cattle to the local people, in order that they might themselves supply as many people as possible with milk, the production and distribution of which had been undertaken by the Agricultural Department before.

During the past years sales of improved breeds of horses, cattle, pigs, and poultry have been made at various centres throughout the Island by the Agricultural Department through the Stock Committee.

Despite all these and allied activities in soil examination, artificial manures, rotation of crops, and other matters connected with agriculture, including the introduction and growing of three kinds of grass, the people have not hastened to change their old methods of grazing animals on any bare land, fallow, or, where possible, in the State Forests.

In the last few months inquiries have been undertaken with a view to introducing a small hardy cow, suitable for the special climatic conditions in the hills of Cyprus.

In a similar way it has been decided to introduce a better breed of goat into the Island, with a view to demonstrating that by keeping a superior animal better returns in milk or cheese can be obtained. At the same time a better class of goat would have to be kept under improved conditions of feeding, and thus be under the care of a man all the time, and not allowed to wander untethered over wide areas of private land or public Forest.

By such means working through the action of economic laws it is to be hoped to benefit Cyprus Agriculture and Forestry so that the country will flourish, as it should with its warm climate.

CONDITIONS OF LAND GRANTS TO GOATHERDS WHO DISPOSE OF THEIR GOATS

1. The walling or terracing of one donum of land for the goatherd who disposes of ten goats yearly.

2. The planting of fruit-trees in the property (1 donum) which is proposed to be granted to the goatherd.

3. The digging of a well or water-channel, constructing of path to the main or village road.

4. The supply of iron or wooden plough as well as various articles.

5. The fencing-in of land to be granted.

6. The value of the hut and tools is as follows:—

	£	s.	d.
(*a*) 1 donum of land (with water)	30	0	0
(*b*) 100 trees (fruit)	4	0	0
(*c*) Wooden plough	1	10	0
(*d*) Iron plough	3	10	0
(*e*) Building of hut	20	0	0

Tools—

	s.	d.			
1. Iron spade	4	0			
2. Iron fork	5	0			
3. Mattock	3	0			
4. Wheelbarrow	18	0			
5. Small pruning saw	2	0			
6. Cross-cut saw	12	0			
7. Felling axe	3	0			
8. Adze	2	0			
9. File	2	0			
10. Whetstone	8	0			
11. Grindstone	5	0			
			3	4	0
Total			£62	4	0

CHAPTER XIX

THE FUTURE ECONOMIC POSITION OF THE ISLAND WITHOUT GOAT-GRAZING IN THE FORESTS

In preceding chapters it has been clearly indicated that slowly but surely a change in the system of agriculture is taking place, and the nomad shepherd is being replaced by the cultivating farmer attached to his holding permanently. This process has also taken place without material friction or loss to anyone. In fact, it would be difficult to name a country where such a complete evolution from one stage of agricultural development has been begun and partially put through without the usual upheaval and upsetting of many people's means of livelihood.

However, with the lever of economic necessity still greater progress can be achieved in the near future. It has always been so easy, and formed the least line of resistance, to graze a herd of goats at the public expense in the Forests or in private property without let or hindrance. Now, grazing in the latter area is only allowed with the permission of the owner and sometimes on very stiff payment. I have heard of cases where 5s. per donum has been asked and paid for rough pasture with an ample water supply.

If the last step could be taken and all goat- and sheep-grazing cease in the Forests, an immense improvement in both Agriculture and Forestry in Cyprus would be possible and would undoubtedly be made. Forage and root crops would have to be grown in quantity for

feeding the animals. In consequence, deeper and more careful cultivation of the fields would have to be undertaken, so that the yields would be far greater than now. Owing to the animals being concentrated on smaller areas, more wells would be sunk in order to supply them with ample water. At the same time, in some cases, this would also be done in order to irrigate patches of forage or root crops raised for the animals. Even allowing that some of these works entail capital expenditure, there is the Agricultural Bank in existence to supply that. In Cyprus many people have a few savings hidden in odd corners of their buildings or rooms with which much of such work could be met, once it was seen that it was profitable and would not be lost to the money-lenders. Under such an intensive system of agriculture far more people would be employed on the land; and the growth of the towns at the expense of the villages and hamlets would be arrested. The urbanization of Cyprus, though slow, is increasing faster than is generally supposed. A perusal of the census figures bear this out. If necessary, in order to accelerate the process of changing over from a more or less pastoral to an intensive system of forage-crop agriculture, it would probably be worth while to lend money to the goatherds with which to buy land, equip it, and help over the initial years of the change. Such loans could be secured on the goats or sheep, and the interest, if necessary, paid in kind (kids or lambs at least three months old).

Already there are good markets in Egypt and surrounding countries for all Cypriot agricultural produce, and it appears that, with the exception of parts of Palestine and Egypt, agriculture is making faster progress in Cyprus than in the other countries near.

With its smaller area, far more intensive teaching, and quality of agricultural produce, sales and shows have a better chance than in larger countries with more scattered populations and less general education. In this respect the position of Cyprus is unique, being almost surrounded with more backward countries, especially Anatolia.

With the greater protection afforded now to private property from illicit grazing by the provision of rural constables, an impetus has been given to tree planting of all kinds. Goatherds are less inclined to root up newly-planted trees than formerly, as this action is now more dangerous and not easily hidden from the watchful eye of the rural constable and the Mukhtar of the village, also probably an owner of fruit-trees. It appears as if at long last the majority of the people see and are alive to the advantages of more intensive systems of agriculture; but the goatherd, who has to be accommodated somewhere, is the stumbling-block to greater progress and financial returns from fields and gardens.

With his banishment from the Forest there would not be the ceaseless damage to trees and field-crops by the passage of his animals to and from the Forest.

As agriculture is the basis of most of the prosperity of Cyprus, so with greater yields from the lands under cultivation business of all kinds would increase. Thus the general mass of the people would be able to live in greater comfort and under better conditions than now.

The following is an instructive example of the rapid way in which progress is being made. In connection with the question of granting goat-grazing permits for the villagers of Xylotymbo, the villagers stated that they had insufficient land for both their flocks and

arable crops. Thereupon I pointed out that the fields were not all cultivated every year, and this was the fallow area on which to graze animals.

Also I stressed the fact that the cultivation of the fields was not nearly deep enough, especially on the very good red soil overlying limestone. I pointed out that with iron ploughs much better results would be obtained. Many of the peasants were not at all pleased at these remarks, but about nine months later I was informed by a farm-implement dealer that this village of Xylotymbo numbered the most amongst his customers and that most iron ploughs had been sold to the people there. As far as I am aware, without a single grazing permit in the Forest, everyone has been accommodated and better crops have been obtained.

Turning now to the equally if not more far-reaching beneficial effects of excluding goats and sheep from grazing in the Forests. First of all, in this sub-tropical climate, there is insufficient rainfall, so that any increase, as, for instance, from growing more and taller trees, has an ameliorative effect on the surrounding agricultural land and increases the yield of the crops grown.

Now in most cases natural regeneration is impossible, or only partially possible, after a period of thirty or more years has elapsed. With increased rainfall, combined with no damage from animals to soil or young plants, it would take place automatically in most places, and succeed quickly within five or ten years. In fact, the whole natural process of the growing and improvement in the number, size, and density of the trees standing on a Forest area would go on uninterruptedly with a corresponding increase in the amount of timber grown each year. The increment of the Forest, which is

now estimated at ten cubic feet per acre per annum, would vary from fifteen to forty cubic feet and more in the most favoured spots. It is safe to estimate at least double or twenty cubic feet per acre per annum. The whole condition of the Forest would change for the better in every respect. In the more favourable localities it would pay to grow more exacting species as to soil and climate than is possible now, or which if grown now experimentally have to be carefully protected against the damage of some stray goat, even in the Stavros Experimental plots of the Paphos Forest. The gain of such measures alone to the country in general are scarcely to be measured accurately without the person estimating being accused of exaggeration.

To give a few figures. At the present time it is estimated that there are about 100,000,000 cubic feet of timber standing in the trees of the Forests of the Island, on which an increment of about 4,000,000 cubic feet is being added year by year. Of this last-named amount at least 1,000,000 is being eaten away or otherwise destroyed through the grazing of goats and sheep. In consequence of this heavy annual loss and other damage, it has been found necessary to restrict the cutting of mature or otherwise fellable trees, especially in those Forests where the goats are most numerous.

Were the Forests relieved of this gigantic drain every year, so much more could be felled, or at any rate part would be available for meeting the very pressing and urgent demands for ploughwood and other timber in those centres of population more distantly situated from the timber-importing towns of the Island. After a few years it would be possible to clear all the old, defective, and over-mature trees out of the Forest, where they now stand as a menace to the

younger trees; but at present, owing to the constant depletion of stock by goat-grazing, this has to be done only on a small scale and very carefully. With the Forest freed from grazing, and natural regeneration assured in many places, the clearing of all poor trees could be undertaken with safety and in the knowledge that the Forest was still being renewed and improved under proper sylvicultural methods. As conditions are now, those who are responsible dare not do it. Any openings made in the scanty canopy of the Forest are not filled with seedlings, or if they are these are as rapidly destroyed by the adverse growing conditions prevailing, with goats running about all the time as well. In the areas which have been partially freed from goat-grazing, as, for instance, the northern side of Chionistra and down towards Pasha Livadhi, the young seedlings appearing everywhere give promise of the better and thicker stock to come. The best example is, of course, near Government Cottage, Troodos, where there has been no goat-grazing at all since the occupation—a thick stand of Corsican Pine clothes the otherwise bare slope, and it is now possible to thin out some of the trees as they are standing too thickly. It is in very few other places in Cyprus where the same can be said, and, in fact, from a considerable knowledge of the Forests I can affirm that perhaps in ten small areas is this possible or desirable, whereas in an average European Forest any middle-aged stand (say, 40–50 years old) has of necessity to be thinned as part of the normal method of growing it. The trees are planted and come up too thickly from natural regeneration, so that Nature does the pruning of the lower branches, which die off in the close shade of such a plantation or stand.

The increase in this kind of Forest produce alone would be enormous after a decade has passed. Under ordinary conditions in Cyprus, without goats bothering them, trees grow very fast indeed, a leading shoot of an Aleppo Pine of over four feet not being uncommon. An annual ring of ¾ to one inch is also not rare. Even the supposed slow-growing Olive is capable, under ordinary Cyprus Forest conditions, without being subjected to the daily attacks of goats, of growing over three feet in height in one season. This is by no means a poor achievement for such a hard-wooded tree.

The ancients have left an indelible picture of the impenetrable Forests here, and even up to the Venetian and early Turkish times the Forests were well known for their beautiful timber in the neighbouring lands. The existing Forests cannot lay claim to such a reputation.

If all the bare hill land mountain-sides from Larnaca through Limassol to Paphos, and from Cape Eleæa to the Karpass were fully clothed with trees, then only would the area be large enough to supply the ship-loads of timber such as were sent away in those days.

Under proper management a similar thriving state of timber export trade can be built up again. However, such a state could not come into existence again until the goat and sheep do not find a place in the Forests for almost perpetual grazing.

Such a policy is necessary, too, for in such a hot climate as Cyprus, with its comparatively low rainfall, it is not possible to retain as much arable or pasture land, as, for instance, in a country like England with double and treble the rainfall and a much cooler climate all the year round. The compensation of Nature is found in the very valuable timber trees,

which can be grown into a size of great financial value rapidly and at the same time close to one of the best and richest timber-markets in the world, namely Egypt. Not within one hundred years or any reasonable period of time, if ever, is there any chance of Egypt becoming self-supporting in the matter of timber and fuel production for its home use. Therefore, it is all the more desirable that Cyprus should take every possible step to insure future bigger supplies, which can be the basis of a large local industry, or supply an ever insatiate timber-market not three hundred miles away.

From the previously mentioned enumeration survey, it has been noted that about 100,000,000 cubic feet of timber are standing in the Forests valued at a low estimate which varies from sixpence to one shilling per cubic foot. Even assuming the lower figure to be correct, there is a total value of about £2,500,000. Again add the annual increment, now partially destroyed by the effects of goat-grazing, of 1,000,000 cubic feet, and also the increased increment, which would accrue without the damage of the goats, in all estimated at 1,000,000 cubic feet per annum, and this amount, valued at only sixpence per cubic foot, shows a total of £25,000. Already in previous estimates sufficient has been allowed for loss by insect and other pests, as well as by storms and other natural phenomena, so with the freeing of the Forests from grazing a large nett increase in volume of timber would accrue each year. It also means, in other words, that as the timber becomes mature this amount more could be cut year by year from the Forests without any detriment to their state. In fact, under proper management, the amount would be still further increased by the introduction of better species than it is possible to grow now.

Under present conditions, the Forest Department is hardly pressed for water supplies for the making of nurseries. Without the present damage to the Forest by grazing there would be ample water for all purposes, including increasing irrigation supplies, which originate in the Forests.

Careful observations show that the stream above Platres has increased in volume steadily, owing to the closing of the canopy and the growing of more seedlings and trees in the catchment area. In 1926 the flow was less, owing to the shortage of snowfall on Troodos in 1925 and the lack of rain during the spring and summer months. The great fires of 1924 apparently desiccated the whole Paphos range even as far as Troodos. It is impossible to have such conflagrations without some widespread temporary or permanent effects.

Many villages now obtain their water supply from the Forest, but more will probably require to do so in the near future. However, if the grazing continues this will not be possible; as already stated above there is not enough for Forestry purposes, let alone to supply outsiders. It is the most serious side of the whole problem, and it cannot be too heavily stressed. This water-conserving capacity of the Cyprus Forests is of great importance to its future existence as a highly civilized country with a dense population. It is not fancy, for direct economic results of freeing the Forests of grazing would soon show themselves. Now the Forests yield a revenue varying from £20,000 to £30,000 each year, and cost £30,000 to £40,000 to manage and replant war fellings. Then with the increased returns, which could be justifiably made from the Forests, it is likely that in ten years' time the whole Forest administration

would be self-supporting. As it is now, on the plea of poverty or lack of respect for the public property, at least £5,000 to £10,000 worth of timber and fuel is stolen every year, while many timber trees are burnt by goatherds or damaged in other ways. Why is Cyprus timber so knotty usually? Simply because it has grown up too unconfined by other trees, but very much restricted and damaged by goat-grazing. If only one or two piastres were added to the value of the timber by its being grown free of knots, many thousands of pounds more would be earned each year. Of the large 24-feet logs sent to England it was said that one end of each was very knotty and detracted otherwise from its value as a Pitch-pine timber.

If after ten years the Department was self-supporting, any Forester would agree that after another ensuing five years there would be a handsome surplus on an analogous scale, as is shown in the administration of the Forests of India. Although the Indian Forest Service started twenty-three years before that of Cyprus, yet with the greater experience since gained in Forestry treatment generally it should not be long before Cyprus takes her place as a country of well-stocked, well-managed Forests fulfilling all its legitimate functions in the economy of the country.

With the Forests freed from grazing, they would form an adequate, if unusual, pledge for the loan of sufficient money to provide necessary means for the making of roads, paths, fire traces, and other Forest ameliorative measures. Without any special effort of extra taxation, here is a most worthy object, easy of accomplishment, attained simply through the relinquishment of a few grazing permits by a minority of seven thousand goatherds and shepherds in the Island. Surely that is

not an impossible task for such an intelligent people as those of Cyprus. Time should show that with the advice given to them they will be willing to forego some temporary advantages to the few for the sake of the welfare of all the people in the Island. The history of the last fifty years' progress will be belied if this is not the case.

It is not an exaggeration to say that without water the population would die out or starve, as the crops could not be grown. At present many people seem to think that it is possible to have every good and beneficial effect from the Forest and yet at the same time handle it anyhow and cut or over-graze it with impunity. If such a policy were possible, the members of the Forest Department would be first to welcome it and give every possible facility, as it would be much more easy, pleasant, and satisfactory for the time being to gratify every whim of the local people for grazing, fuel, timber, water, and any other Forest produce. Bad Forestry takes time to show itself, and even after fifteen or twenty years there would be no apparent difference. However, a trained, conscientious Forester advising a modern up-to-date Government cannot be a party to such a short-sighted and absolutely detrimental policy to the future of the Forests and, lastly, to the Island itself.

Everyone has yet to learn that the conservation and proper regular utilization of Forests is one of the essentials of good Government in any country. Without it there is no real prosperity; with it there is ample timber, water, and every amenity of life. Without it there is stagnation, slow dwindling of resources, and, finally, a poor state of civilization; with it progress, quickening industry, and all benefits of modern civilization. It is for the Cypriot to choose which he really

desires his Government to pursue. If timely advice is duly taken, there may be yet a very bright future for the country, and contentment and prosperity to the many instead of only to the few. It is for the true patriots of the country to insist that real Forestry is practised without fear or favour, with the intention that the Forests should confer the maximum benefits on the whole community for all time and not only for the present generation. Surely that is a worthy object for the citizens of even a small Island in the Mediterranean to undertake and afterwards to be proud of wherever they may go.

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